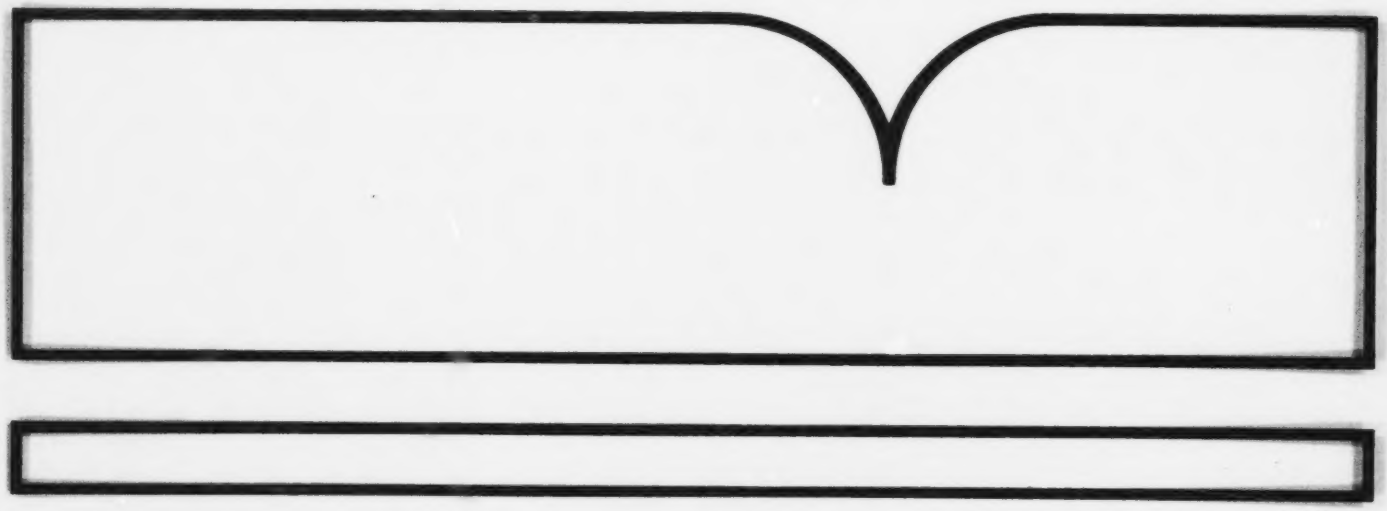
PB88-106539

Superfund Record of Decision (EPA Region 6)
Bayou Bonfouca, Slidell, Louisiana
March 1987. Second Remedial Action

(U.S.) Environmental Protection Agency
Washington, DC

31 Mar 87



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United States
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Office of
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EPA/ROD/R06-87/019
March 1987

PB88-106539

EPA

Superfund Record of Decision:

Bayou Bonfouca, LA

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Bayou Bonfouca site is an abandoned creosote works facility that was operational from 1892 to 1970. It is located north of Lake Pontchartrain in Slidell, Louisiana in a 100-year flood plain, and is characterized by standing water and saturated surface soil. The creosote plant treated pilings for use in railway construction. Over the years, the plant operated under the ownership of various creosote companies. Present property ownership is with the Braseman Corporation. Numerous creosote releases occurred during the years of operation. Since 1976, numerous studies were done to examine the extent of the problems orginating from the Bayou site and in December 1982, the site was placed on the NPL. The primary contaminants of concern are polynuclear aromatic hydrocarbons (PAHs) including: benzo(a) pyrene, benzo(a)anthracene, benzo(b)flouranthene, benzo(k)fluoranthene, indeno(1,2,3-cd) pyrene, and chrysene. In August 1985, excavation and offsite landfilling on creosote waste piles was addressed in a source control operable unit ROD. The determination of the extent of soil contamination was the focus of this second operable unit. Currently, ground water and surface water are the primary natural resources affected. Additionally, 20,000 yds^3 of soils and 46,500 yds^3 of sediments lining the bayou, a creek, and a drainage channel are contaminated.

(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Bayou Banfouca, LA Contaminated Media: soil, SW, GW, sediments Key contaminants: PAHs		

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EPA/ROD/R06-87/019
Bayou Banfouca, LA

16. ABSTRACT (continued)

The selected remedial action includes: incineration in a mobile unit of creosote accumulations (5000 yds^3) present on the surface; incineration of contaminated sediment (46,500 yds^3) from the bayou, creek and channel bottoms; isolation followed by drainage and dredging of one half of the bayou; excavation of sediment to about 5 feet or to a depth that will ensure mitigation of the source of ground water contamination by creosote; routing of the flow through the clean area upon completion of excavation and then, drainage and dredging of the opposite side of the bayou; dewatering of bayou sediments prior to offsite transportation; onsite treatment and discharge to the bayou of water drainage from the dewatered side of the bayou, alone with drainage associated with the dewatering activities; capping of contaminated soil (20,000 yds^3 34 acres) with a RCRA cap; and remediation of ground water through a pump-treat reinjection process. The estimated capital cost for the remedial action is $59,594,534 with annual O&M costs estimated to be $173,748.

1.a

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Bayou Bonfouca, Slidell, Louisiana

DOCUMENTS REVIEWED

I have reviewed the following documents describing the analysis of the cost-effectiveness of the remedial alternatives for the Bayou Bonfouca site.

- Site Investigation, Bayou Bonfouca, April 1986.
- Feasibility Study, Bayou Bonfouca, June 1986.
- Health Assessment, Agency for Toxic Substances and Disease Registry, September 1986.
- Technical Assistance for Response to Public Comment, September 1986.
- First Technical Assistance Memorandum for Development of Record of Decision, January 1987.
- Second Technical Assistance Memorandum for Development of Record of Decision, Black and Veatch, January 1987.
- Report of Public Hearing, July 1986.
- Report of Public Hearing, February 1987.

DESCRIPTION OF SELECTED REMEDY

- Excavation and onsite incineration of creosote waste piles and heavily contaminated bayou sediment
- RCRA cap
- Pump and treat groundwater

DECLARATION

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by Superfund Amendments Reauthorization Act of 1986 and the National Contingency Plan (40 CFR Part 300), I have determined that the selected alternative for the Bayou Bonfouca site is cost-effective and provides adequate protection of public health, welfare, and the environment. The State of Louisiana

continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period of one year.

I have also made the determination that the action being taken is appropriate when balanced against the availability of the Trust Fund monies for use at other sites.

March 31, 1987
DATE

Robert E. Layton Jr.
Robert E. Layton Jr., P.E.
Regional Administrator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Bayou Bonfouca, Slidell, Louisiana

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CONCURRENCES

SYMBOL	6H-SA	6H-S	6H	6C-H	6T-H				
SURNAME	GAERTNER	EDLUND	DAVIS	[illegible]	[illegible]				
DATE					2/20				

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has been consulted and agrees with the approved remedy. The action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. These activities are considered part of the approved action, and eligible for Trust Fund monies for a period up to one year.

The remedial plan will also include long-term groundwater pumping and treatment. The costs associated with these activities are eligible for Trust Fund for a period of up to ten years. I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other site.

DATE

Robert E. Layton Jr., P.E.
Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

BAYOU BONFOUCA

SLIDELL, LOUISIANA

EXECUTIVE SUMMARY

SITE DESCRIPTION

The Bayou Bonfouca Superfund Site is an abandoned creosote works facility that was operational from 1892 to 1970. Mound-shaped accumulations of creosote are present on the surface and asphaltic material covers much of the surface. Polynuclear aromatic hydrocarbons (PAH's) from the creosote compounds have contaminated soil, bayou, creek and channel bottom sediments, surface water, and groundwater. Groundwater is contaminated in a surficial aquifer and in a shallow artesian aquifer.

PROPOSED REMEDIATION

Proposed remediation at the Bayou Bonfouca site includes incineration in a mobile unit of creosote accumulations (5000 yds^3) present on the surface and incineration of contaminated sediment from the bayou, creek, and channel bottoms (46,500 yds^3). One half of the bayou will be isolated, it will then be drained and dredged. Sediment will be excavated to about 5 feet or to a depth that will ensure that the source of groundwater contamination by creosote is mitigated and the threat to aquatic biota is minimized. Upon completion of excavation, the flow will be routed through the clean area and the opposite side of the bayou will be drained and dredged. The bayou sediments will be dewatered prior to offsite transportation. Water draining into the dewatered side of the bayou, along with the drainage associated with the dewatering activities will be treated by an onsite treatment plant and discharged to the bayou. Contaminated soil (†100 ppm PAH) will be capped with a RCRA cap (20,000 yds^3; 34 acres). Groundwater will be remediated through a pump-treatreinjection process. The Louisiana Department of Environmental Quality concurs with this remedy (Appendix F).

SUMMARY OF REMEDIAL
ALTERNATIVE SELECTION

BAYOU BONFOUCA
SLIDELL, LOUISIANA

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SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

Bayou Bonfouca
Slidell, Louisiana

SITE LOCATION AND DESCRIPTION

The Bayou Bonfouca is located about 7 miles north of Lake Pontchartrain in Slidell, Louisiana. It is at the southwest corner of West Hall Avenue and Bayou Lane (Figure 1). The site has an area of about 55 acres. Land use east of the site is primarily commercial; to the north it is heavily wooded. To the southwest, across the Bayou Bonfouca, is a residential subdivision. About 750 residents live within one mile of the site.

The site is an abandoned and dismantled creosote works facility that lies on a flat, mostly overgrown parcel and is within the designated 100-year flood plain of the bayou. The site is bounded on the east by a drainage channel and on the west by Western Creek. The area is characterized by standing water and saturated surface soil. The contaminants of concern at the site are potentially carcinogenic polynuclear aromatic hydrocarbons (PAH's) that are common in creosote compounds: benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, and chrysene. Figure 1 depicts the extent of contamination. Figure 2 shows sample locations, the locations for stratigraphic cross-section A-A' and hydrogeologic cross-section B'B' are the same and are also shown in Figure 2.

Morphologically the bayou is asymmetrically U-shaped in cross section. Stratigraphy of the site is shown in Figure 3. The bayou has incised through a thin layer of surficial silt and man-made fill into a fractured, but cohesive clay layer. This clay layer has a maximum thickness of 25 ft. and forms the sides and bottom of the bayou. Beneath the deepest part of the bayou, this clay layer is only 3 feet thick. There are two significant clay layers present in the stratigraphic interval of interest, an upper cohesive layer and a lower cohesive layer. The bayou has dissected the upper cohesive layer. The upper cohesive layer is the upper bounding surface of sand and silt that grades downward to an interval of silty and sandy clay. These sand, silt and clay intervals are called the granular layer (appx. 3 feet in thickness) and the interbedded granular and cohesive layer (about 6 feet thick), respectively. The lower bounding surface of this interval is the lower cohesive clay. The lower cohesive layer is about 20 feet thick and is underlain by a sand unit that was not fully penetrated.

Three distinct water-bearing zones are identified at the Bayou Bonfouca site; the surficial aquifer, the shallow artesian aquifer, and the deep artesian aquifer. The aquifer system is depicted in Figure 4. The surficial aquifer (+2 to -8 MSL) is located within the upper cohesive layer and extends upward into the surficial fill and silt layers. The shallow artesian aquifer (-11 to -27 MSL) is located within the upper

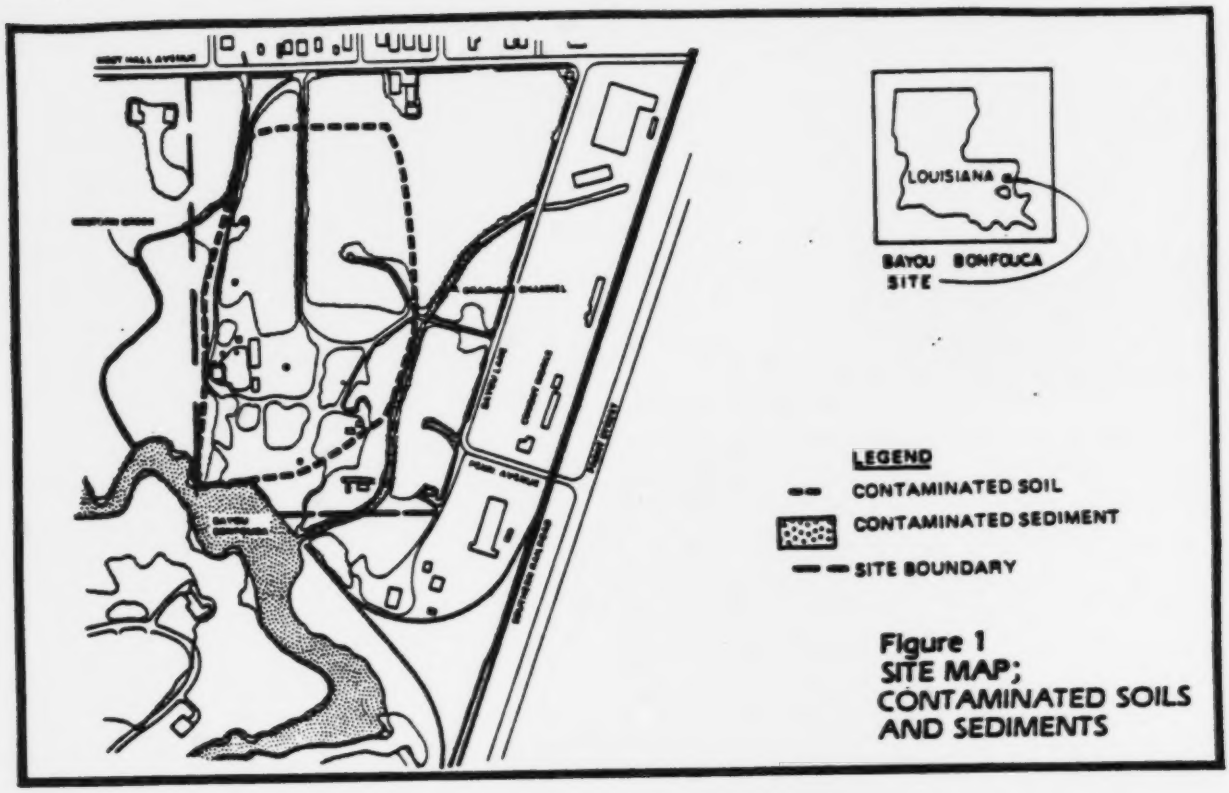

Figure 1
SITE MAP;
CONTAMINATED SOILS
AND SEDIMENTS

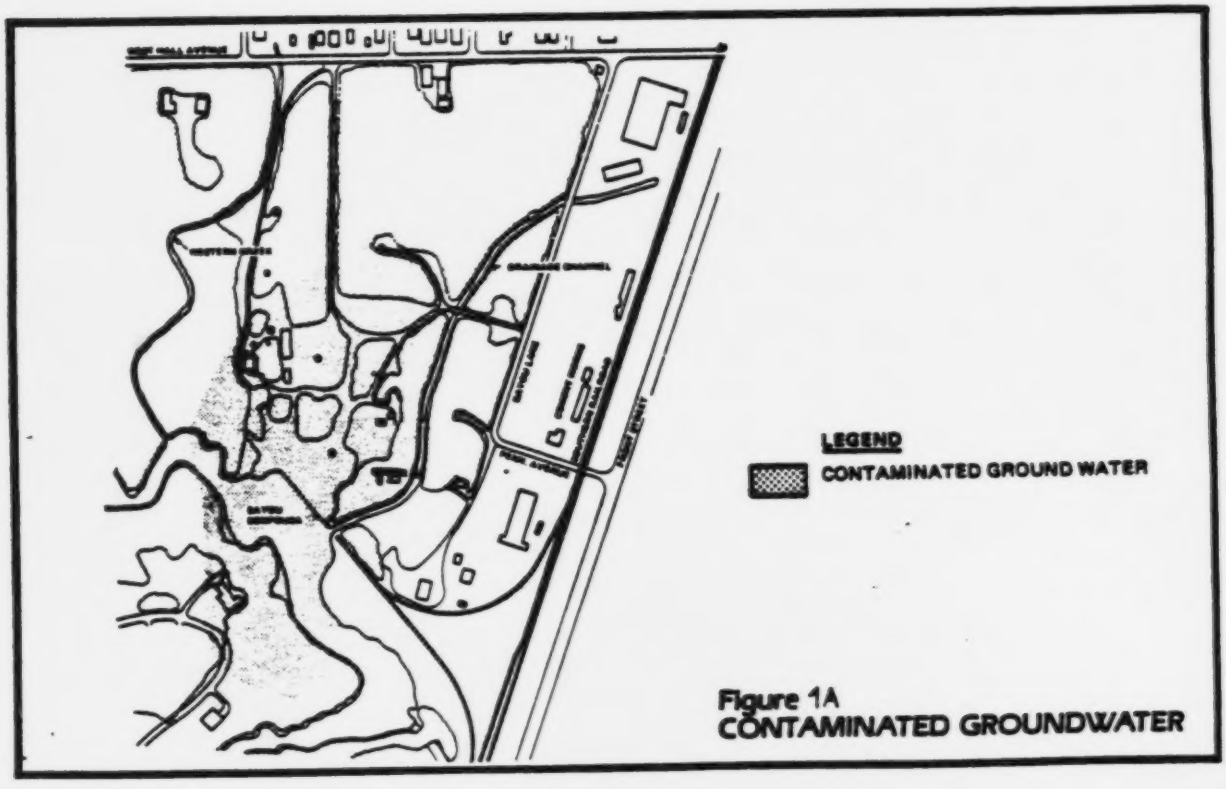

Figure 1A
CONTAMINATED GROUNDWATER

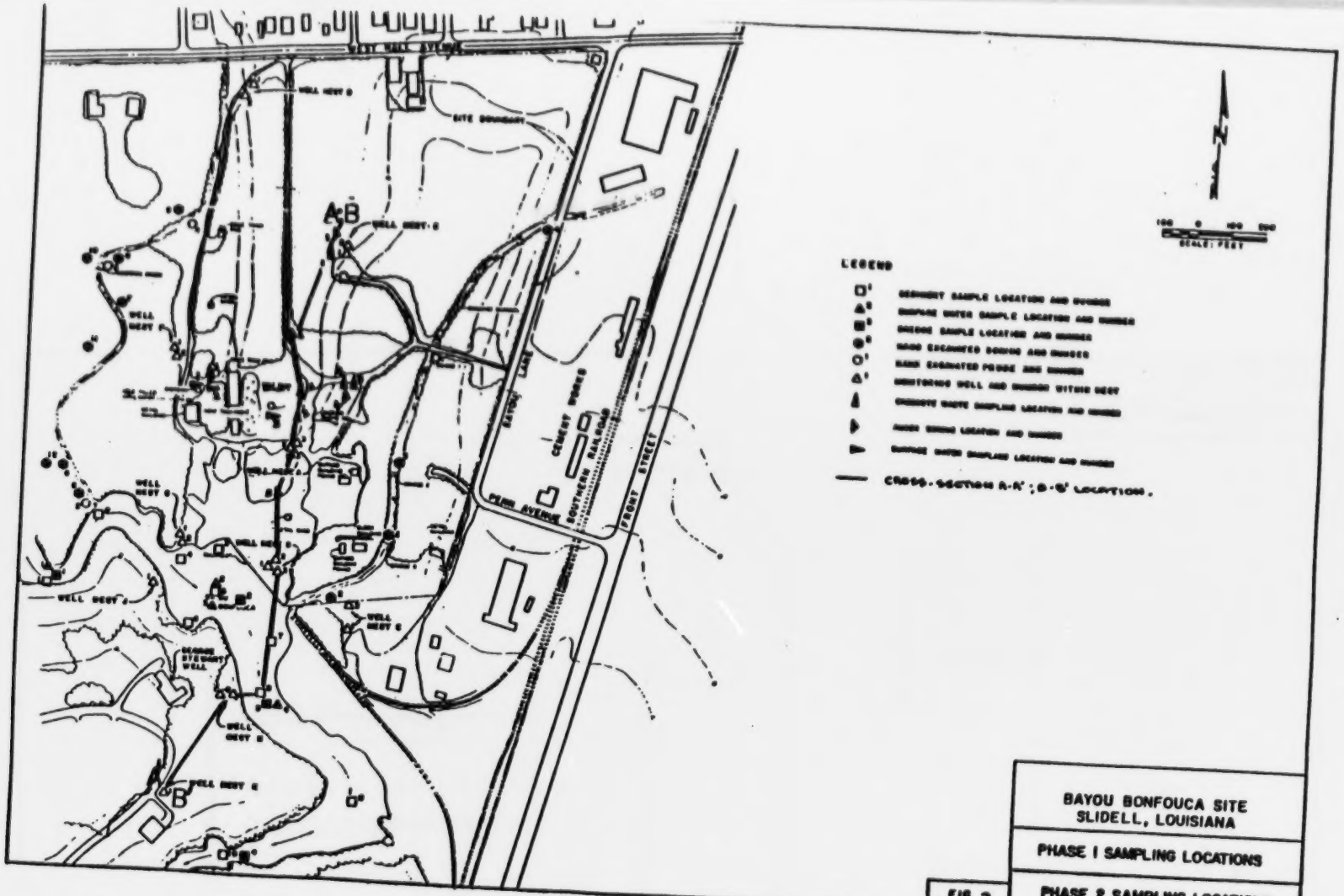

FIG. 2.

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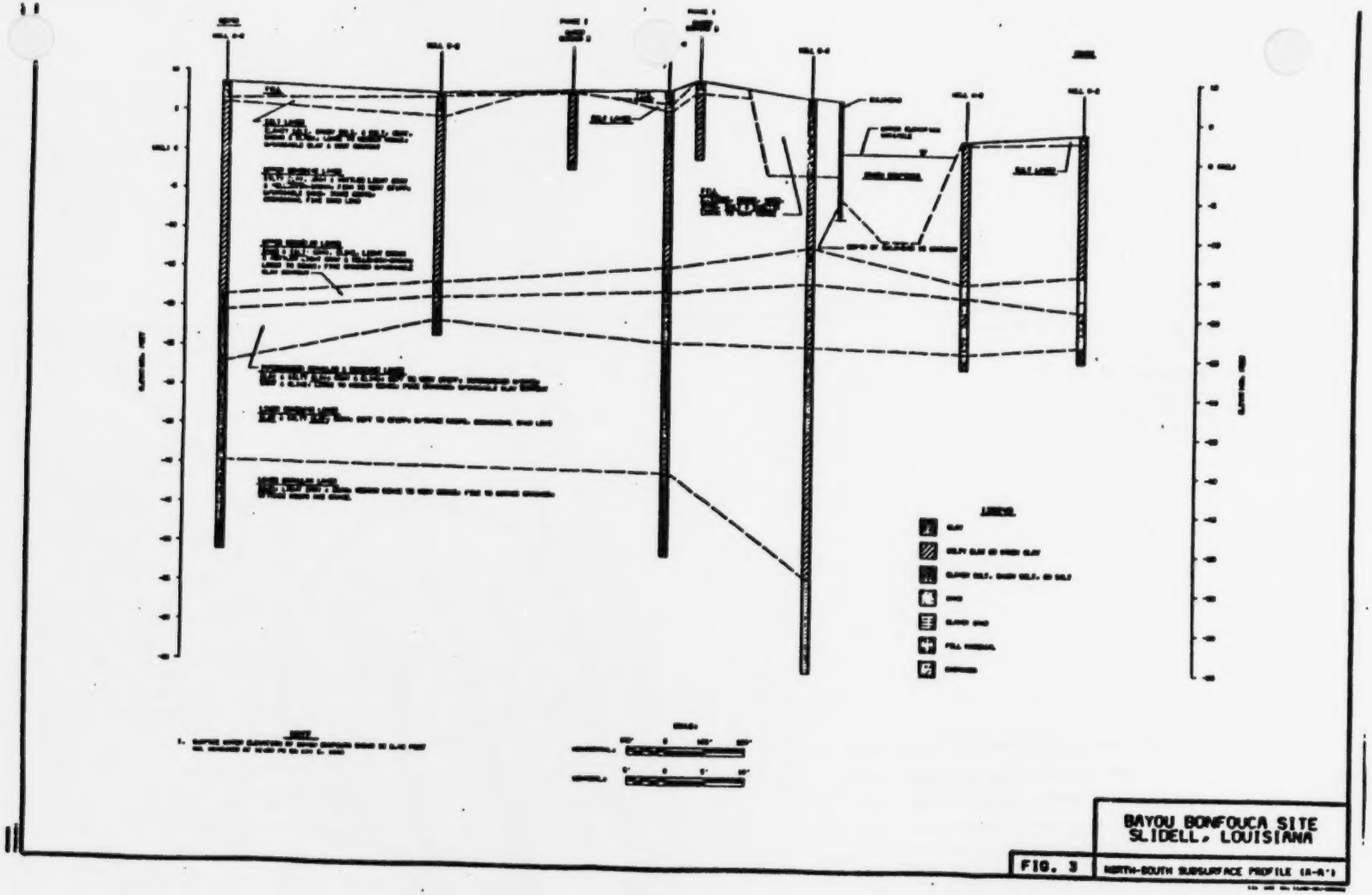
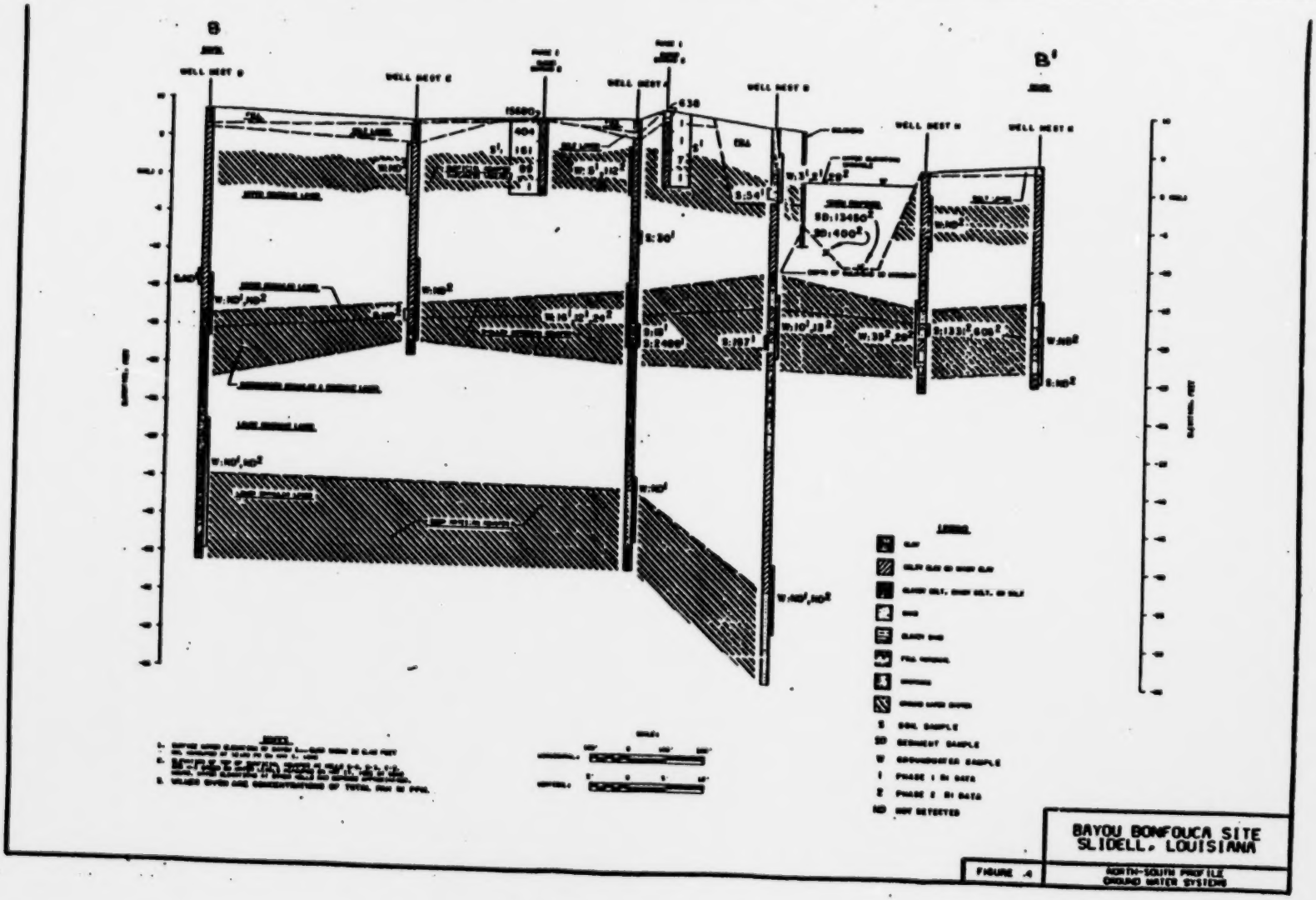


BAYOU BONFOUCA SITE
SLIDELL, LOUISIANA

FIG. 3 NORTH-SOUTH SUBSURFACE PROFILE (A-A')



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granular layer and the interbedded granular and cohesive layer; it is confined above and below by the upper and lower cohesive layers. The lower cohesive layer forms the upper confining layer of the deep artesian aquifer (-40 to ?MSL); this aquifer is located within the lower granular layer. The principal aquifer for the 26,000 residents of Slidell is the Pontchatoula, at 1500 feet (-1490 MSL) below the ground surface.

The primary natural resources that are adversely affected by the Bayou Bonfouca PAH contaminants are groundwater and surface water. Creosote also contaminated soil and sediments at the site surface (Figures 1, 4) and in the subsurface. PAH migration probably occurred through fractures observed in the upper cohesive layer. The highest PAH concentrations are found on the ground surface in the areas of the creosote waste deposits. These deposits constitute about 5000 yds^3 of waste. Contaminated soil near the surface shows a rapid decrease in concentration, from 15,680 ppm at the surface to 1 ppm within 9 feet of the surface. Significantly contaminated soils form about 20,000 yds^3 of material. In the surficial aquifer, soil and groundwater are contaminated. No contamination of near surface soil deposits was found offsite. Contamination was detected in soil at only one location below 10 feet. The soil was otherwise uncontaminated until the shallow artesian aquifer was encountered; soil and groundwater are contaminated in this aquifer. Contamination is also present in the sediments lining the bayou, the Western Creek, and eastern drainage channel. These sediments form about 46,500 yds^3 of contaminated material.

SITE HISTORY

The earliest records of the Bayou Bonfouca site date back to 1892. The creosote plant treated pilings for use in the construction of a railway across Lake Ponchartrain. Over the years, the plant operated under the ownership of various creosote companies including Southern Creosoting Company, Hattiesburg Creosoting Co., Gulf States Creosoting and American Creosote Works. Present property ownership rests with the Braselman Corporation. Numerous releases of creosote occurred during the years of operation.

In 1976, the U.S. Coast Guard undertook an investigation of the Bayou Bonfouca waterway. This was supplemented by another study conducted by the EPA, the Coast Guard, and the National Oceanic and Atmospheric Administration in 1978. At the time, methods for dredging the Bayou Bonfouca were felt to be environmentally unsafe and merited more study. A cleanup proposal for the on-site contamination proposed by Braselman Corporation in 1981 was rejected as inadequate by the State of Louisiana. The site was included on the National Priority List in December 1982. The Remedial Investigation/Feasibility Study was initiated in late 1983 with the first phase of the field work completed in the summer of 1984. In late 1984, the EPA determined the need for an operable unit approach to the site. The surface contamination was the subject of the Focused Feasibility Study completed in May 1985. The Phase I (Source Control) Record of Decision, which specified excavation and off-site landfilling of creosote waste piles, was signed August 15, 1985. The remedial design (RD) and remedial action (RA) activities associated with this phase experienced delays due to the pending reauthorization of Superfund.

A Supplemental Phase II Remedial Investigation was performed in March 1986 to determine the extent of soil contamination beyond that of the Phase I investigation. Final Phase II Remedial Investigation and Supplemental Remedial Investigation Reports were received in April 1986. The Phase II Feasibility Study was completed in June 1986.

CURRENT SITE STATUS

In July 1986, a public meeting was held in which citizens requested a 3 month extension of the public comment period to end October 31, 1986. During this time the Superfund Amendments and Reauthorization Act was signed and the proposed selected remedy for Bayou Bonfouca did not fully comply with the provisions of the Act. The new law sets stricter clean-up standards and has a strong preference for permanent technologies that either treat or destroy wastes.

Since 1976, numerous studies have been undertaken to examine the extent of the problems originating from the Bayou Bonfouca site. During the remedial investigations (Phase I and II), surface and subsurface exploration encompassed data from surface water, ground-water monitoring wells and their borings, hand-augered borings, a test pit, and bathymetric and geophysical surveys (Figure 3). These data were used to evaluate sediments at and beneath the surface and the hydrogeologic conditions at the site. Surface water, groundwater and sediment samples were chemically evaluated to determine the extent of contamination.

These studies indicate four areas of major creosote contamination, generally in the south half of the site area. The greatest volume of creosote is at the bottom of the Bayou Bonfouca. This deposit contains an estimated 46,500 cubic yards of creosote extending 1400 feet downstream from the site. Thickness of the deposits ranges from 1 foot to 3 feet. The second area of concern is the creek and drainage path which border the site. The creek bottom and creek floodplain along the western side of the site contain approximately 1600 cubic yards of creosote contaminated sediment while the drainage ditch on the eastern portion of the site contains approximately 400 cubic yards of creosote contaminated sediments. The third area of identified contamination includes the eight locations of known on-site creosote waste deposits. Approximately 5000 cubic yards of creosote wastes are contained in these deposits. The fourth area of creosote contamination is in the upper groundwater zones beneath the site.

Prior to the EPA remedial investigation of 1984, no ground-water contamination attributed to the site had been reported, and limited hydrogeologic site characterization had been performed. The results and findings of the EPA investigation are discussed in the following pages. These findings are grouped by contaminated media.

STATIGRAPHIC SETTING

The maximum depth of exploration at the Bayou Bonfouca site was 73 feet. Seven sedimentary layers were described, consisting of sand, silt, and clay layers, some of which are interbedded. Included in the sedimentary material is a surficial layer of man-made fill.

Figure 3 is a schematic representation of the stratigraphy at the site. At the surface, the layer of man-made fill is surrounded as well as underlain by silt. The fill ranges in thickness from 0.3 to 10 feet and is formed by cinders, brick, wood, sand, silty clay, and shells. The silt layer contains abundant clay and some sand and ranges in thickness from 0.5 to 3 feet. The surficial aquifer, located primarily in the underlying cohesive silty clay layer, extends upward into the surficial material.

The upper cohesive layer is a fractured, silty clay that contains traces of sand. The upper reaches of this layer form the majority of the surficial aquifer but the lower reaches function as the uppermost confining layer of the shallow artesian aquifer. The upper cohesive layer ranges in thickness from 3.0 feet under the deepest part of the bayou to 24.5 feet at the sides of the bayou. Open and closed fractures that were observed in the upper confining layer during drilling increase the permeability of this layer, more appropriately described as an aquitard. Laboratory tests reveal that the permeability of this layer ranges from 3.4×10^{-8} to 2.8×10^{-9} centimeters per second. Because of the presence of fractures, which generally increase permeability, this laboratory estimate is probably low. Laboratory analyses are quite localized and cannot be expected to account for a more regional phenomena, such as fractures. Bathymetric and geophysical surveys show that the upper cohesive layer is continous across the site.

The upper granular layer is composed of sand and overlies the interbedded granular and cohesive layer, a zone of sand and clay. These units are about 8 feet thick and are confined above and below by the upper and lower cohesive layers. These layers form the shallow artesian aquifer and appear to be continous across the site.

The lower cohesive layer, a zone of clay and silty clay, ranges in thickness from 12.5 feet to 29.0 feet. It also acts as the upper confining layer for the deepest unit explored in this study, the lower granular layer.

Thin lenses of sand and silt are present in the upper parts of the lower granular unit and grade out with depth. The layer is continous across the site and no fractures were observed. Results of laboratory permeability analyses indicate that permeability ranges from 3.8×10^{-8} to 2.7×10^{-7} centimeters per second. The lower granular layer is composed of sandstone, none of the wells fully penetrated this layer. This layer forms the deep artesian aquifer.

SURFICIAL CREOSOTE WASTE DEPOSITS

Surficial concentrations of waste creosote and debris have accumulated in eight areas on the site. Contamination from the freshly treated lumber that was stored at the site. Figure 1 shows the location of the contaminated areas on the site. The physical characteristics, dimensions, and volumes of the eight areas are summarized in Table 1, their volume is calculated to be about 5000 cubic yards.

These deposits are up to 2 feet in height and have visually contaminated the underlying soils to as much as 1 foot below the surface. The waste deposits contain about 10% total PAH (polyaromatic hydrocarbons), as shown by analytical results and range in concentration from not detected to 120,000 ppm, no dioxin was detected in dioxin analyses (2,3,7,8-TCDD). In general, the contaminated areas have a surface layer of black, asphaltic material. Standing water partially covers most of the creosote concentrations and boreholes commonly filled with water during excavation, indicating saturated surface soil.

TABLE 1

DESCRIPTION AND VOLUME OF CONTAMINATED AREAS

AREA	VOLUME (CY)*	DESCRIPTION
1	4,250	Approximately 1200 feet^2 between 2 concrete slabs is covered by marshy areas, standing water and debris. Visually contaminated soils to 9" below surface.
2	70	Covered by surface water. Visually contaminated soils to 2", leaching to 6.5" below surface.
3	120	Surface water covers 50% of area. Visually contaminated to 3" below surface.
4	100	Contains mound of solidified creosote and debris approximately 2° high.
5	120	Soils visually contaminated to clay at 11.6" below surface.
6	185	Hard, asphltic surface, contaminated to 6.6" below surface.
7	125	Wooded and marshy area, adjacent to contaminated stream. Contamination to 6" in woods, 1° near stream.
18	75	Surficial contamination to 2".

* Volume estimate includes creosote material, soils below visual contamination, and debris.

GROUND-WATER INVESTIGATION

Twenty ground-water monitoring wells were installed at the site during the remedial investigations to determine the hydrogeologic conditions

and to evaluate ground water contamination. Well sites and sampling locations for Phase I and II are shown in Figure 2. The wells were installed either separately or in nests, each nest consisting of two to three wells. Each individual well within a nest monitors a specific groundwater zone.

Water level readings in the monitoring wells and observations during drilling indicate that there are three discrete gound-water aquifers (Figure 4). These are identified as: 1) the surficial aquifer (+2 MSL); 2) the shallow artesian aquifer (-11 to -27 MSL); and 3) the deep artesian aquifer (-40 to ?). The shallow and deep artesian aquifers were classified as such because the ground water is under sufficient pressure to rise above the base of the upper confining layer.

Water level readings obtained throughout the investigations indicate that the shallow and deep artesian aquifers are discrete aquifers and not directly connected hydraulically. If the aquifers were connected, hydrographs for a given point in time should show the same potentiometric surface. The potentiometric surface elevations of the individual wells within a nest at the Bayou Bonfouca site were not the same, therefore the aquifers are not directly connected.

Field observation of soil samples obtained during drilling revealed the existence of open and closed fractures in the upper cohesive layer. If interconnected, these fractures could represent conduits for contaminant migration from the surficial aquifer to the shallow artesian aquifer. The existence of these fractures does not necessitate a direct connection between the two aquifers, however, their existence creates the potential for contaminant migration.

Surficial Aquifer

The surficial aquifer is located in the topmost upper cohesive layer and the in fill and silt layers (Figures 3 and 4). Potentiometric contour maps of the surficial aquifer indicate that the ground-water flow gradient of this aquifer is 1×10^{-2} feet per foot to the east and south.

The surficial aquifer is locally contaminated with organic compounds. The total PAH (polyaromatic hydrocarbons) concentrations identified in surficial groundwater are shown in Figure 4. Results of the organic chemical analyses show that PAH contamination ranges from ND to 112 ppm. The surficial aquifer is also contaminated with inorganic compounds. Primary drinking water standards for arsenic, barium, cadmium, chromium, lead and selenium are exceeded and secondary drinking water standards for copper and zinc are exceeded. The inorganic contaminants may be associated with the creosote wastes but a waste characterization was not done and records of the site do not contain this information.

Shallow Artesian Aquifer

The shallow artesian aquifer is formed by the upper granular layer and the interbedded granular and cohesive layer (Figures 3 and 4). It is

confined above by the upper cohesive layer and below by the lower cohesive layer. Potentiometric contour maps of this aquifer show that the groundwater flow gradient is 1 x 10^{-3} feet per foot and generally to the southwest.

The shallow artesian aquifer is present beneath the bayou. The presence of fractures in the upper confining layer creates the potential for fluid migration between the bayou and the shallow artesian aquifer. Migration may occur if a head differential (a difference between the surface water elevation of the bayou and the potentiometric surface of the shallow artesian aquifer) is created between the bayou and the shallow artesian aquifer. Migration would occur from that water source with a greater head to that of a lesser head. Based upon the elevation data obtained, the direction of potential migration may alternate between surface water flowing from the Bayou into the shallow artesian aquifer and groundwater flowing from the shallow artesian aquifer into the Bayou. Although the Bayou elevation fluctuates with tidal effects, there is no apparent short-term direction relationship between the Bayou surface water elevations and the potentiometric surface of the shallow artesian aquifer (Figure 5).

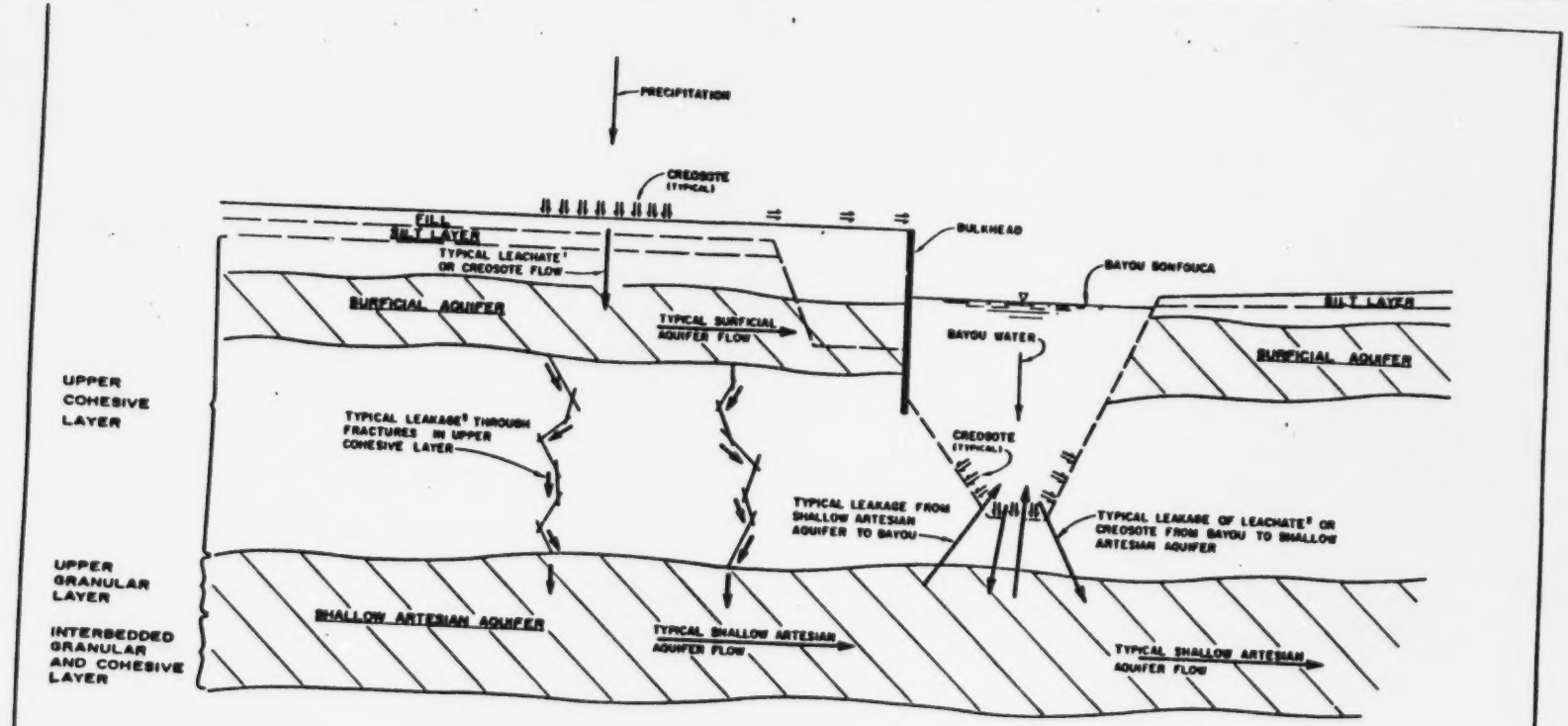
The shallow artesian aquifer is locally contaminated with organic compounds. The PAH (polynuclear aromatic hydrocarbon) concentrations identified in the shallow artesian groundwater are shown in Figure 4. Visually, water from the shallow artesian aquifer is dark brown and appears to be oily. Groundwater samples taken from 20 feet and 27 feet were described as having an oily sheen.

The results of the inorganic chemical analyses from the shallow artesian aquifer show that iron and manganese exceed the secondary drinking water standards. Background levels for these elements are high, however, and are not considered to be an indication of contamination.

Deep Artesian Aquifer

The deep artesian aquifer is about 50 feet (-40 MSL) below the surface. Its upper confining surface is the lower cohesive layer (Figures 3 and 4). Potentiometric contour maps of the deep artesian aquifer indicate that the groundwater flow gradient of this aquifer varied from 1 x 10^{-4} to 6 x 10^{4} feet per foot during the investigations. The permeability of this aquifer is approximately 2 x 10^{-2} centimeters per second as determined by laboratory tests.

The deep artesian aquifer is not contaminated with PAH's, as shown by chemical analyses. The secondary drinking water standards for iron and manganese are exceeded in the deep aquifer, as they are in the shallow aquifer. However, the high levels for iron and manganese are ubiquitous to the area and are not considered to be an indication of contamination.



NOTES:

1. LEACHATE CREATED BY PRECIPITATION, OR SURFACE WATER RUNOFF FLOWING THROUGH CREOSOTE.
2. LEACHATE CREATED BY BAYOU SURFACE WATER FLOWING THROUGH CREOSOTE ON BOTTOM OF BAYOU.
3. THE ORIENTATION, SPACING AND CONTINUITY OF FRACTURES IS UNDEFINED, BUT THE EXISTANCE OF FRACTURES IS DOCUMENTED ON THE BORING LOGS.

NOT TO SCALE

LEGEND

- DIRECTION OF CONTAMINANT OR CONTAMINATED WATER MIGRATION
- CREOSOTE SOURCE
- UNCONTAMINATED WATER

BAYOU BONFOUCA SITE
SLIDELL, LOUISIANA

FIG. 5 SCHEMATIC CONTAMINANT SOURCE AND MIGRATION PATHS

Existing Area Wells

Seven existing water wells were sampled during the remedial investigations. The wells were between 1,000-2,300 feet in depth with the exception of one 100-feet well.

The organic chemical analyses indicated that these wells were not contaminated with site-related compounds. The primary drinking water standard for cadmium is exceeded and the secondary drinking water standards for iron, manganese, and zinc are exceeded. According to the Louisiana Department of Environmental Quality (LDEQ), groundwater quality is generally poor in this area of the State with respect to organics and sulfides.

SURFACE WATER

Surface water samples were taken from the bayou during the Phase II remedial investigation to determine if the waters are contaminated. In order to determine the effect of sediment turbidity on resuspension of contaminants, surface water samples were taken before and after disturbing the bayou sediments. Although an oily sheen was observed on the water surface, the analytical results did not indicate that the Bayou water is contaminated by creosote constituents. This is probably due to a phase separation of the sediments and PAH's from the surface water prior to their analysis, followed by analysis of only the water phase of each sample.

SEDIMENT

Bathymetric and geophysical surveys were undertaken to delineate the bayou morphology and sediment characteristics. These surveys were also used to determine sample locations for core recovery and chemical analyses. The bathymetric survey shows that the Bayou is asymmetrically U-shaped in cross-section. It is about 10 feet deep in the center of the bayou, and has a maximum depth of 11 feet. The upper cohesive layer, a silty clay layer, is about 3 feet thick beneath the bayou, as shown by the geophysical survey.

The bottom of the Bayou is covered by a layer of decaying vegetation and leafy debris that is heavily contaminated by creosote. Core samples show that consolidated but loosely cohesive sediment immediately underlies the vegetative debris. The unconsolidated sediment was also visibly streaked with creosote and some samples had large creosote globules. The upper cohesive layer beneath the bayou is also contaminated, based on laboratory analyses. Analytical results show that total PAH's range from ND to 13450 ppm. Figure 1 depicts the extent of sediment contamination.

Hand excavated samples and probes were used to determine the extent of sediment contamination in Western creek and in the eastern drainage channel. In the lower reaches of both the creek and channel, creosote odors were evident when the sediments were disturbed, and a surficial layer of oil was observed on the water surface. Analytical results show

that PAH concentrations in the sediments range from ND to 260 ppm. The sediment thickness in the western creek and eastern drainage channel varied from less than 6 inches to more than 3 feet. Steep banks on the drainage channel, combined with relatively thick contaminated sediments, made access for measurement and sampling difficult. Additional measurement will be required to verify contaminated sediment quantities.

SOILS

Laboratory tests indicate soil contamination in essentially two zones: 1) the surface and near-surface soils and 2) the shallow artesian aquifer onsite. The surface and near-surface soils are heavily contaminated but show a rapid decrease in concentrations with depth, from 15680 ppm at the surface to 1 ppm within 9 feet. Except at one location the soil was otherwise uncontaminated until the shallow artesian aquifer was encountered. Soil contamination is thought to have been the result of PAH migration through fractures in the upper cohesive layer. PAH soil contamination ranges from ND to 2488 ppm in the shallow artesian aquifer. Contamination was not detected in or below the lower cohesive layer.

ENFORCEMENT

Initially two Potentially Responsible Parties (PRPs) were identified: American Creosote Works, Inc., the last wood treating company to own and operate the site, and Braselman Corporation, the present owner of the site.

American Creosote Works, Inc. (ACW), a Texas Corporation, owned/operated the facility from 1958 until 1972 when economic problems forced the closure of the operation. In 1975 ACW was sold, the former stockholders of ACW formed Braselman Corporation which retained the Bayou Bonfouca property.

Braselman Corp., beginning in 1980, negotiated with the State of Louisiana to develop a mutually agreeable cleanup plan. These negotiations were unsuccessful. EPA and Braselman have also discussed the cleanup and the company has verbally indicated that it is interested in cleaning up the land portion of the property, but that it may not have the resources to undertake a CERCLA-approved cleanup.

EPA, Region 6, mailed "Notice Letters" to ACW and Braselman for the source control Remedial Design/Remedial Action. In a letter received by EPA on June 14, 1985, ACW declined involvement with the site cleanup.

In a letter received on July 22, 1985, Braselman Corporation declared an inability to pay for the site cleanup.

In October 1985 a contractor was hired to perform a PRP search under a TES 2 contract. In June 1986, EPA mailed "Notice Letters" for the bayou/groundwater Remedial Design/Remedial Action. To the American Creosote Works and to the Braselman Corporation.

ALTERNATIVES EVALUATION

Objectives

The following are the remedial objectives developed for the Bayou Bonfouca Site:

* Reduce or eliminate the potential for ingestion of carcinogens in groundwater, surface soils, and shellfish.

* Control the migration of PAH contamination in the shallow artesian aquifer and other aquifers.

* Reduce or eliminate the direct contact threat posed by Bayou sediments and onsite surficial creosote waste deposits.

Pursuant to the Superfund Amendments and Reauthorization Act of 1986 (SARA) there are new requirements to be considered in addition to the requirements of CERCLA for selecting the most appropriate remedial action for implementation. The new provisions include a strong preference for permanent solutions and a requirement that all onsite remedial actions attain legally applicable or relevant and appropriate Federal and state standards, requirements, criteria or limitations (ARARs).

In addressing permanence and long-term effectiveness the following items must be considered:

- long-term uncertainties of land disposal;
- goals and requirements of the Resource Conservation and Recovery Act (RCRA);
- persistence, toxicity, mobility, volume, and bioaccumulation;
- short and long-term potential for adverse human health effects;
- long-term maintenance costs;
- potential threat to human health and the environment from the excavation, transportation, and redisposal, or containment of hazardous substances or pollutants or contaminants.

SARA establishes a preference for remedial actions that utilize treatment to permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances. Remedies should minimize the requirement for long-term management and/or monitoring. Remedies which consist of offsite transport and disposal of waste without treatment are least preferred.

Although the original RI/FS (June 2, 1986) predates SARA, several permanent remedies (as defined by SARA) were considered among those analyzed in detail. In addition, three supplemental memorandums developed by the EPA contractors (September 13, 1986, January 12, 1987, and January 13, 1987) reviewed in greater detail innovative and permanent technologies.

Appendix A lists the potentially applicable remedial actions studied for the Bayou Bonfouca site. The technology screening process was consistent with 40 CFR Part 300.68 (g) and draft guidance distributed pursuant to

SARA. Combinations of technologies were identified and developed into alternative remedial actions. To the extent that it was both feasible and appropriate, treatment alternatives for source control actions were developed ranging from an alternative that would eliminate the need for long-term management (including monitoring) at the site to an alternative using as a principal element a treatment that would reduce the toxicity, mobility, or volume of site waste. Nine alternatives were considered within this range. In addition, to comply with SARA, two other alternatives were reviewed. These are:

1) An alternative that involves containment of waste with little or no treatment, but provides protection of human health and the environment primarily by preventing potential exposure or reducing the mobility of the wastes.

2) A no-action alternative.

This screening process (for technology/alternative review) was divided into two steps; initial screening and detailed screening. The initial screening of alternatives was conducted with the intent of:

1) preserving the most promising alternatives as determined by their likely effectiveness and implementability.

2) preserving for futher analysis a range of alternatives consistent with the new SARA provisions.

Those technologies surviving the initial screening were further screened utilizing the following criteria:

1) Effectiveness. Alternatives were evaluated as to whether they adequately protect human health and the environment; attain Federal and State ARARs or other criteria, advisories or guidance; significantly and permanently reduce the toxicity, mobility, or volume of hazardous constituents; were technically reliable, or were effective in other respects.

2) Implementability. Alternatives were evaluated as to the technical feasibility and availability of the technologies each alternative would employ; the technical and institutional ability to monitor, maintain, and replace technologies over time; and the administrative feasibility of implementing the alternative.

3) Cost. The costs of construction and any long-term costs to operate and maintain the alternatives were evaluated.

4) Component measures of site specific evaluations considerations.

Those remedial technologies passing through final screening were then assembled to form nine remedial alternatives including the no-action alternative. The action alternatives are broken down into two categories; source control and groundwater. There were eight source control alternatives studied in detail and only one groundwater alternative. After the initial screening step and after considerable review, only

one groundwater remediation plan was thought capable of adequately addressing the contaminant plume. This will be discussed in more detail.

During the development of the ROD, the alternatives evaluated in the RI/FS report were modified to some degree. These modified alternatives and the remedial technology to be employed for each specific media are presented in Table 2. Detailed cost estimates appear in Appendix C. An explanation for the modifications follows:

- o Considering the passage of SARA and the Agency's reevaluation of the FS alternatives , the excavation and offsite disposal of the onsite creosote waste deposits was viewed as inappropriate. The creosote waste deposits will be addressed as part of the proposed remedial action for phase II.

- o All reviewed action alternatives will consider groundwater restoration in that they propose a pump/treatment/injection network both on and offsite. Areas where groundwater contamination exists will not be capped with a RCRA cap. The soil will be capped because there is a threat of ingestion; the groundwater will be pumped and treated.

- o The ATSDR health assessment for the site indicated that onsite soil concentrations with less than 100 ppm carcinogenic PAH would pose no significant ingestion risk to public health. After close inspection, the Agency supports ATSDR's conclusions. An earlier study performed by EPA's contractor suggested an action level of 1 ppm. This level was derived in the early stages of health assessment and was based on the single most hazardous compound found in creosote wastes rather than total PAH's. Since creosote wastes are not one pure compound and are composed of several polynuclear aromatic hydrocarbons, not all of which are carcinogenic, more recent studies show that total PAH's more closely approximate a realistic action level that is protective of human health and the environment.

  The areal extent where concentration of total PAH are †100 ppm is smaller than the area where concentrations are 1 ppm. Therefore the area and volume in need of remediation is smaller.

- o Costs for both onsite and offsite incineration were updated.

Alternative No. 1 is a no-action alternative. It involves no additional work or monitoring at the site and is not consistent with SARA. There would be no mitigation of the hazards currently associated with the site as addressed earlier under Current Site Status, and is not protective of human health or the environment.

Groundwater Alternatives

Alternatives No. 2 through No. 9 employ identical measures for remediating groundwater contamination. To prevent further contaminant migration, contaminated groundwater onsite and in the vicinity of the contaminated reach of the bayou will be surrounded by slurry walls which will be tied into the lower cohesive layer beneath the shallow artesian aquifer.

Table 2

Summary of Remedial Alternatives

Assembled Alt. No.	Media Specific Remediation Technology To Be Employed			
	Bayou Sediment	Creosote Waste Piles	Onsite Soils	Groundwater
1	none	none	none	none
2	permanent diversion; in-place stabilization backfill and cap	onsite landfill	cap	slurry wall around site and bayou; pump and treat contaminated groundwater
3	bayou partition off-site landfill	Off-site landfill	"	"
4	bayou partition on-site landfill	On-site landfill	"	"
5	bayou partition on-site incineration	onsite incineration	onsite incineration	"
6	bayou partition on-site incineration	"	cap	"
7	bayou partition on-site biological treatment	onsite biological treatment	"	"
8	bayou partition off-site site landfarming	offsite landfarming	"	"
9	bayou partition off-site incineration	offsite incineration	"	"

* Includes sediments withing Weston Creek and drainage channel on eastern side of the site.

Contaminated groundwater will be extracted, treated, then reinjected. Groundwater reclamation will first occur offsite (easements would have to be obtained to install the offsite groundwater treatment system offsite). If proven successful, the same technology will also be employed onsite. The current criteria by the Clean Water Act for drinking water only suggests a contamination level no greater than 3.1 ng/l for PAH's. The technical feasibility of cleaning the groundwater to this level is unknown. The groundwater treatment system currently envisioned will extract and treat to the extent technologically practicable. This aspect of the remediation plan is in essence a pilot study. Until groundwater extraction starts, it is not known exactly what type of cleanup levels can be expected.

Contamination exists in two class II aquifers and the intent of the current remediation proposal is to meet applicable ARARs. This will have to be reviewed in the light of the data generated during the groundwater reclamation actions.

Source Control Alternatives

With respect to other contaminated media (Bayou sediment, creosote deposits, and onsite soils) the alternatives are as follows:

Alternative No. 2 is an onsite closure intended to minimize the migration of contaminants and to reduce the environmental impacts from the site. This alternative specifies the permanent relocation of the bayou through a residential subdivision. After relocation, the isolated reach of the bayou would then be drained.

Bayou sediment would be mechanically mixed with a stabilizing agent such as fly ash, kiln dust, lime or cement. Following stabilization the channel would be backfilled and a RCRA cap installed over the contaminated Bayou reach. The envisioned RCRA cap would encompass the site and contaminated portions of the bayou. The cap would be five feet in height, and covered with vegetation.

Some doubt exists about the effectiveness of stabilizing agents in permanently immobilizing high organic-content wastes such as those expected in the bayou sediment. The potential for a continuing or future release would exist from the bayou sediment and also the onsite creosote waste deposits. This alternative can be implemented rapidly with conventional technology. Present worth cost for this alternative is relatively low. Furthermore, institutional considerations would have to be resolved prior to implementing this remedy. These concerns include the implications of relocating a navigable waterway, restoration of equivalent floodwater conveyance to minimize upstream effects, and the acquiring of land within the affected subdivision. Long-term site monitoring and maintenance would also be critical factors.

This alternative complies with the provisions of SARA in that the mobility of site wastes is reduced because the wastes would be solidified and because of the existence of a RCRA cap. It does not minimize the need for long-term maintenance and monitoring.

Alternative No. 3 entails the excavation and offsite disposal of the bayou, creek and channel sediments along with the creosote waste deposits. The remaining contaminated soils would be capped with a RCRA cover. These soils are not considered a potential threat to the groundwater. Investigative analyses have indicated that the levels present in the site soils would bind to the area clay and not migrate. The cleanup of the bayou would be accomplished by splitting the bayou into two sections allowing a portion of the bayou to be dewatered for sediment removal. This will be accomplished through the installation of sheet pilings.

One half of the bayou will be isolated, it will then be drained and dredged. Upon completion the flow is routed through the clean area and the opposite side of the bayou will be drained and dredged. The bayou sediments would be dewatered prior to offsite transportation. Water draining into the dewatered side of the bayou, along with the drainage associated with the dewatering activities would be treated by an onsite treatment plant and discharged to the bayou. There would be no destruction or detoxification of the wastes. Costs for implementing this alternative are relatively low and this alternative can be readily implemented using conventional technology. Long-term public health and the environment in the vicinity of the site would be improved due to the relocation of contaminated sediments and waste piles, which pose a direct contact and ingestion threat, out of the area. However, a public health risk assocciated with spillage of contaminants during shipment will exist.

The SARA statute specifically discourages the offsite transport of contaminated materials without treatment and states that offsite transport and disposal is the least preferred remedy.

Alternative No. 4 is similar to alternative no. 2 except that dewatered bayou sediment would be placed in a hazardous waste landfill constructed onsite. The design of the landfill would meet RCRA specifications. Cost for this alternative would be relatively low. The technology is conventional and can be implemented within a moderate period. Public health and the environment would be improved due to the secure disposition of sediments and waste piles which present a direct contact and ingestion risk. However, since there would be no destruction of the wastes perpetual operation and maintenance of the onsite landfill unit would be necessary. Restrictions to control future land use would need to be applied at the site.

Alternative No. 4 does not minimize the need for long-term operations and maintenance. This remedy is not permanent and in this respect it does not comply with SARA.

Alternative No. 5 consists of the onsite incineration of contaminated bayou, creek and drainage ditch sediments, in additon to the onsite creosote waste deposits and contaminated site soils.

This alternative would partition the bayou with sheet pilings as discussed to effect sediment cleanup; all site wastes would be destroyed. A RCRA cap would not be necessary over the site.

Alternative 7 has yet to be effectively demonstrated. The Region was unable to locate studies that definitively proved that biological degradation could effectively treat the waste within a reasonable time frame. Alternative 7 complies in theory with the intent of SARA.

A variation of alternative No. 7 was considered where onsite biological treatment would be performed in high-rate aerobic digestion. Creosote waste deposits would be blended with wet sediment and subjected to biological treatment in tanks or lagoons outfitted with aeration equipment. Dewatering would occur following an appropriate aeration period (constituent concentration reduced below relevant health criteria) and treated residuals would be land applied at the site and covered by a RCRA cap. This approach would presumably afford greater control over the microbial degradation process and lead to more rapid and complete destruction. The waste materials would be containerized rather than land applied and, therefore, the technology would not be subject to the land ban. Biological treatment experts at EPA's R.S. Kerr Lab and the Cincinnati Hazardous Waste Engineering Research Center were contacted to obtain information pertaining to the feasibility of this modified biological approach. A contractor reported to supply such biological systems and a creosote manufacturer with considerable remedial experience were also contacted. The consensus of opinion was that more research is required to be able to guage the effectiveness and appropriate operational parameters associated with such a bioremediation technology. No actual cost estimates were developed but such were expected to be moderate due to additional costs of tankage, aeration equipment and aeratory energy.

Alternative No. 8 is similar to No. 7 except that dewatered bayou sediment and creosote waste deposits would be transported to an offsite, commercial landfarm facility. Present-worth costs associated with this alternative would be moderate to low. It should mentioned that a public health risk associated with spillage of contaminants during shipment would exist. Alternative 8 also complies with SARA.

Alternative 8 proposes the same technology as Alt. No. 7. Biological degradation of wastes shows promise, but is yet unproven.

The last alternative considered, No. 9, is essentially the same as Alternative 6 except offsite incineration instead of onsite incineration would be utilized. These wastes would be incinerated at an offsite facility qualified to accept and process Superfund wastes. The estimated present worth cost for this alternative is relatively high. Although it was assumed that an appropriate facility in Region 6 could be utilized, currently there are no offsite incineration facilities in Region 6 permittted to accept Superfund wastes as per EPA's Offsite Policy. The facilities nearest the site which can process these solid materials and which are presently compliant with the Offsite Policy are located in Illinois and South Carolina. Both these facilities require special waste "packaging" procedures. If no facility in Region 6 is compliant with the offsite policy at the time of construction contract award, a substantial cost increase would be associated with using either the South Carolina or Illinois facilities.

Onsite incineration of these wastes produce a residual ash that would most likely be delistable and would be disposed of onsite. This is the only alternative which considers removal of the 20,000 cubic yards of onsite soils contaminated in excess of a concentration of 100 ppm total carcinogenic PAHs (ATSDR's memo dated September 11, 1986, in Appendix C). The onsite soils have a significant absorptive capacity for PAH's. By removing the PAH's down to 100 ppm all significant site contamination would be removed and a RCRA cap would be unnecessary.

Due to the incineration of the relatively large volume of onsite soils, the present-worth cost of this alternative is one of the highest of the alternatives considered. The onsite thermal destruction system incorporating incineration would be designed and built to meet all Federal and state standards.

Alternative No. 5 complies with SARA in that it reduces the mobility, toxicity, and volume of the creosote wastes. The cost-effectiveness of this remedy is not maximized.

Alternative 6 is identical to Alternative 5 except that the onsite soils will not be incinerated. To prevent ingestion and direct contact with the soils it will be necessary to construct a RCRA cap on the site. Long-term maintenance of the site cap would be required to ensure that onsite soils would not become exposed and thereby create a direct contact and ingestion risk. The estimated cost for this alternative is much less than that estimated for Alternative 5. Technical feasibility, public health, and institutional concerns are almost identical to those referenced for Alternative 5.

Alternative No. 6 complies with SARA in that it signficantly reduces mobility, toxicity, and volume of the creosote wastes.

Alternative No. 7 entails the excavation and onsite land treatment (microbiological degradation) of the contaminated bayou, creek and channel sediment along with the creosote waste piles.

This alternative would partition the bayou with sheet piles as discussed in alternatives 3-6, to allow for bayou sediment cleanup. Theoretically, the majority of site wastes would be destroyed. A RCRA cap would be placed over that portion of the site containing residual contamination.

Employment of such technology would likely result in a certain degree of hazardous waste destruction with a corresponding benefit to public health. However, the biokinetic rate of reaction and the efficiency and residual concentrations are not known. This technology is potentially promising but is unproven. Also, several site specific conditions exist which bring the technical feasibility of the landfarming remedial scheme into question. Among these conditions are the location of the site within the 100 year floodplain of the bayou and the excessive amount of rainfall received in the vicinity of the site. Due to the expected slow degradation rate for the creosote compounds of concern, this alternative has the longest implementation period (estimated 5 years). Operation and maintenance requirements would be substantial during the operating years.

Public health benefits from the proposed action would be realized due to the removal and destruction of the bulk of the site waste. However, a public health risk would be associated with possible spillage of contaminants during transport to the offsite incinerator.

This alternative does comply with SARA. It provides the same level of protection as Alternative No. 6 yet it is more expensive.

All remedies, with the exception of the no-action alternative, will be designed to comply with all appropriate and relevant Federal and State standards and requirements.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

As part of the FS process, applicable and relevant Federal, state and local laws and regulations (ARARs) were reviewed. The final alternative selected, as mentioned, will attain ARARs. Table 3 summarizes these standards and requirements and their impact on the remedial alternatives.

During the course of the investigative work, and during the development of the RI/FS, the EPA coordinated with both the Army Corps of Engineers (COE Kansas City) and the Louisiana Department of Environmental Quality. The New Orleans COE was also utilized. Coordination with these groups helped ensure that Federal, state and local concerns were addressed. The environmental laws of most relevance are discussed below:

- Executive Order 11988 - Floodplain Management

  The site is within the 100-year floodplain of Bayou Bonfouca. Any onsite remedial action that could affect the floodplain must be addressed to minimize or eliminate adverse impacts. This law is relevant to all action alternatives studied.

It is imperative that all bayou work be conducted to minimize increased flooding potential. The impacts of a site cap will have to be analyzed during the remedial design of the selected alternative.

- Executive Order 11990 - Protection of Wetlands

  The Bayou Bonfouca site itself represents a heavily disturbed area which does not exhibit the characteristics of a wetland. Therefore, the site would not be regulated under section 404 of the Clean Water Act. To the west of the site, however, is an area that arguably may be characterized as a potential wetlands. During site remediation activities, care will be taken to minimize any adverse affects to this area.

- Clean Water Act (CWA)

  Since contaminated groundwater will be treated and reinjected, this law will have limited applicability to the site remedial activities. It is applicable for those waters associated with bayou excavation activities and sediment dewatering. After a designated segment of the

bayou has been isolated and drained, a sump pump system will be installed to remove water seeping in from the bayou and from the surficial groundwater aquifer. This water will be collected and treated onsite and discharged in compliance with the CWA.

As part of the dewatering process, the drained water will be collected and treated onsite and discharged in compliance with the CWA.

- Resource Conservation and Recovery Act (RCRA)

The environmental law that most impacts the site is RCRA. RCRA requires (in part) that at final closure of a hazardous waste landfill, the site be capped with a final cover designed to minimize long-term fluid migration through the closed landfill, function with minimal maintenance, promote drainage and minimize erosion, etc. RCRA guidance documents suggest a multi-layered cap that has a permeability less than or equal to the bottom of the landfill. RCRA further requires, assuming contamination does not exist, that the groundwater be monitored for a thirty-year period to ensure the adequacy of the closure.

In addition to the above, RCRA requires that groundwater contamination beyond the point of compliance be cleaned up to background, a maximum concentration limit (MCL), or an alternate concentration limit (ACL). The "point of compliance" (½264.95) is defined as a vertical surface located hydraulically downgradient from the limit waste management area and extends down into the uppermost aquifer underlying the regulated unit. The point of compliance at the Bayou Bonfouca site is the facility property line.

RCRA requirements that have applicability for offsite transportation of hazardous wastes are the manifesting requirements and the statutory land ban of specified wastes. Any waste transported offsite will be in compliance with Subpart E of ½264 (Manifest System, Record Keeping and Reporting).

This law impacts all of the reviewed alternatives. Alternative 1 does not comply with the technical requirements of RCRA, all other site actions do comply with the provisions of RCRA. Any offsite disposal or treatment facility utilized will require a RCRA permit and all wastes will be manifested. Residual contamination left onsite will be capped in accordance to RCRA's closure regulations and guidance. Onsite incineration will comply with applicable RCRA provisions.

TABLE 3

LAWS, REGULATIONS, AND STANDARDS APPLICABLE
AND REVELANT TO BAYOU BONFOUCA

Law/Regulation	Source of Regulation	Alternative Affected
FEDERAL		
Resource Conservation and Recovery Act (RCRA	40 CFR 262 (Manifest) 40 CFR 264, 265 (Requirements for TSD facilities)	All alternatives involving transportation of hazardous wastes to off-site treatment, storage, or disposal facilities (TSDF).
Underground Injection Control (UIC) Program: Criteria and Standards	40 CFR 146	Not applicable to any alternative.
Permit requirements for Structures in or Work Affecting Navigable Waters of the U.S. (Section 404 Permit)	33 CFR 322	All alternatives involving sediment removal or permanent diversion of Bayou Bonfouca.
Permit requirements for Discharges of Dredged or Fill Materials Into Waters of the U.S. (Section 404 Permit)	33 CFR 323	All alternatives involving sediment removal.
Response in a Floodplain or Wetland	40 CFR, Part 6, Appendix A	All alternatives involving construction in designated flood hazard areas.
National Emissions Standards for Hazardous Air Pollutions	Clean Air Act, Section 112 State Implementation Plan	Applicable to alternative involving incineration of the soil and sediment.
National Environmental Policy Act	NEPA Section 102(2)(C)	CERCLA actions are exempt.
Intergovernmental Review of Federal Programs	40 CFR 29	All alternatives requiring federal and state funds or a cooperative agreement between the state and federal agencies.

Law/Regulation	Source of Regulation	Alternative Affected
Relocation Assistance and Property Acquisition	Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1979, 40 CFR 4	Applicable to alternative involving construction of new bayou reach.
Worker Safety and Health Protection	OSHA	Covers working conditions for worker health and safety for on-site alternatives.
National Pollutant Discharge Elimination System	Clean Water Act, Section 402 40 CFR 122, 125 Subchapter N	All alternative involving source discharges to Bayou Bonfouca.
Effluent Guidelines and Standards	40 CFR 400, Subchapter N, Federal Water Pollution Control Act.	All alternatives involving discharge to a publicly owned treatment works. Not applicable to Bayou Bonfouca.
Federal Standards for Toxic Pollutant Effluent	40 CFR 129	All alternatives involving discharges to Bayou Bonfouca.
Hazardous Materials Regulations	49 CFR 170 to 179	All alternatives involving interstate transportation of hazardous materials.
EPA Groundwater Strategy	EPA Policy Statement	Applicable to all alternatives. Contaminated aquifer classified as Class B-2 aquifer.
Conservation of Wildlife Resources	Fish and Wildlife Coordination Act	Applicable to all alternatives except No Action. This act requires agency consultation prior to modifying any body of water.
Preservation of Scientific, Historic, or Archaeological Data	Archaeology and Historic Preservation Act of 1974	Not applicable.
Preservation of Rivers on the National Inventory	Wild and Scenic Rivers Act, 40 CFR Part 6.302	Not applicable.

Law/Regulation	Source of Regulation	Alternative Affected
Protection of Threatened or Endangered Species and Their Habitats	Endangered Species Act, 50 CFR Part 402	Not applicable.
Federal Ocean Dumping Requirements	40 CFR 220-224 40 CFR 220-224	Not applicable. No alternative involves ocean dumping.
STATE		
Louisiana Hazardous Waste Regulations	Act 449	Applicable to owners and operators of all facilities that transport, treat, store, or dispose of hazardous waste. Permit requirments need to be addressed for new hazardous waste management facility at the site or remote from the site.
LOCAL		
Land Use, Zoning and/or Building requirements	City of Slidell Municipal Codes, and St. Tammany Parish Codes	Applicable to all alternatives involving construction, demolition or remedy on site within municipal/parish boundary.

The groundwater will be treated as closely as technically possible to MCLs. This will be done both on and offsite.

RECOMMENDED ALTERNATIVE

Section 121 of SARA adds a new section to CERCLA that established a variety of requirements relating to the level of a cleanup for remedial actions under CERCLA. This section codified many of the existing requirements under the National Contingency Plan (NCP), but also establishes additional directives for selecting permanent remedies and for meeting state requirements (ARARs).

The basic requirements for a selected remedy are that the remedial actions be:

1) Protective of human health and the environment;
2) Cost effective;
3) In accordance with the NCP;
4) In accordance with the new SARA provisions, ie; permanent solutions to the maximum extent practicable, ARARs and least preference for offsite disposal of untreated wastes and ARARs.

Considering the current and potential site hazards and taking into account the site characteristics, the recommended remedial action is alternative No. 6; onsite thermal destruction of the creosote waste deposits, and the contaminated bayou, Western Creek and drainage channel sediments in a mobile incinerator (the term incineration is used for convenience, the exact type of thermal destruction system has not been specified). The Louisiana Department of Environmental Quality concurs with the proposed remedy (letter in Appendix F).

The Louisiana Department of Environmental Quality was requested, in a letter dated January 1987, to inform the EPA of any State or local ARARs that could affect the implementation of the remedial action. After numerous meetings and phone conversations the State has not identified ARARS other than those established by EPA. Their written concurrence with the proposed remedy, (located in Appendix F) is taken as concurrence on and acceptance of the ARARS discussion given in this document.

Contaminated sediments will be excavated either to a depth of about 6" into the upper cohesive layer or until PAH contamination is less than 1300 ppm. This level will mitigate further groundwater contamination as well as significantly reduce hazard to aquatic biota according to test conducted at the site. This plan will also utilize a groundwater extraction-treatment-reinjection process to clean the existing contaminant plume. Once the site activities have been completed, that portion of the site (approximately 34 acres) with contaminated soil above applicable health based standards (100 ppm total carcinogenic PAHs is one such criteria) will be capped with a RCRA cap.

The residual contamination will be adequately attenuated and adsorbed by the local clays so as to mitigate any potential future impacts on

the groundwater. Field tests and literature studies support this conclusion.

The groundwater extraction process will be designed to achieve applicable and relevant Federal and state standards. The Clean Water Act drinking water criteria suggests a 3.1 ng/l level for PAH's. The groundwater remediation will in essence be a pilot study. Until specific field data are collected it is unknown what clean-up levels will be technologically acheivable. The target clean-up will be a health-based 10^{-4} or 10^{-6} level as per FS guidance.

The site will be monitored for a period of 30-years after site closure. This period is stipulated under RCRA and it is meant to ensure that no significant contaminant migration takes place.

The alternative is protective and cost-effective, attains ARARs and utilizes permanent solutions and treatment technologies to the maximum extent practicable.

The onsite thermal destruction system will be state-of-the-art and will meet all applicable Federal and state requirements (ARARs). Mobile incineration has been demonstrated as an effective destruction technology for wastes similar to those found at the site. The ash produced from the site will likely be delisted and left onsite.

OPERATION AND MAINTENANCE

Project operation and maintenace will include a monitoring well sampling/analysis program and site cap maintenance. Costs are itemized in Appendix B. O&M activities will be conducted by the State of Louisiana for a minimum period of 30 years, after which time the need for continued monitoring will be evaluated.

The groundwater extraction and treatment system is expected to operate for several years. The EPA, as provided under SARA, will provide for 100 percent of the costs for this activity within the first 10 years. If this activity extends beyond this period, the State of Louisiana will be responsible for those costs.

SARA also states that if an alternative results in any hazardous substances, pollutants, or contaminants remaining onsite, the remedial action shall be reviewed at least every five years to assure that human health and the environment is being adequately protected.

The current source of funds for matching remedial actions at a Superfund site in Louisiana is the Site Clean-Up Fund (Section 1149, Title 30). This fund, which currently has $1.6 million dollars, is available to the state to match Superfund action. There is a $2.0 million cap on this fund. The Hazardous Site Clean-Up Fund collects money from civil penalties and cost recovery efforts.

PLANNED SCHEDULE

- Approve Remedial Action (sign ROD)	March 1987
- Initiate Design - REM Contractor	April 1987
- Start Design	June 1987
- Complete Design	February 1988
- Award Interagency Agreement Construction - COE oversight	February 1988
- Start Construction/Remediation	May 1988
- Complete Excavation and Incineration (1 yr)	October 1990
- Complete Groundwater Remediation	Approximately 1994

FUTURE ACTIONS

Future actions will depend upon the effectiveness of the groundwater extraction and treatment. If fully successful, no future remedial activities should be necessary. If, it is found that cleanup of the contaminated groundwater plume to the Clean Water Act levels is technically feasible, other remediation activities may have to be investigated.

APPENDIX A

BAYOU BONFOUCA COMMUNITY RELATION
RESPONSIVENESS SUMMARY.

This community relation responsiveness summary is divided into the following section:

Section I: Background on Community Involvement and Concerns. This section provides a brief history of community interest and concern raised during the remedial planning activities at the Bayou Bonfouca site.

Section II: Summary of Comment Received during the Public Comment Period. Comment are categorized by topics and EPA's responses are provided.

I. BACKGROUND ON COMMUNITY INVOLVEMENT

From 1882 until 1970 a wood treating facility operated in Slidell, Lousisana adjacent to the Bayou Bonfouca.

Community concern regarding the site dates from the mid-1970s when in reponse to a local newspaper, the U.S. Coastguard began investigating creosote pollution in Bayou Bonfouca.

In May 1980 the Bayou Bonfouca Environmental Society was formed largely to express opposition to Champion Shipgard's proposal to locate a ship building facility on the site. The Chamber of Commerce sponsored a public meeting to discuss the issues involved. Opposition to ship building centered on the potential for stirring up creosote that had settled in the bayou.

Local and state-wide media attention focused on Bayou Bonfouca when it was placed in 1982 on the Superfund National Priorities List.

EPA began multi-phase remedial investigation feasibility studies in May 1984. A program update fact sheet describing Phase I of the study results was sent to interested people in April 1985. On June 12, 1985 EPA held a public meeting to discuss alternative remedies for the surface contamination at the site. Thirty people attended the meeting; six people commented or asked questions. No written comments were received.

Local officials including the city engineer were also briefed on June 12, 1985. They expressed major concern about all the alternatives EPA presented.

The final plan for the surface remedy was announced August 28, 1985. It required the removal (excavation) of 5000 cubic yards of creosote wastes and creosote contaminated debris and the transporting of the material to an off site landfill. The plan also called for soil back-filling and compacting. This would provide a minimum of 2 feet of clay and 18 inches of top soil at the site. The area would be re-vegetated and properly graded to assure drainage and minimize erosion.

In June 1986 EPA issued a project update fact sheet reporting an end to the Phase II remedial investigation feasibility study. It presented nine alternative remedies for contaminated waste and three options addressing contaminated groundwater. A public meeting was held on July 17, 1986 to discuss the remedial alternatives.

At that meeting several requests were made for EPA to extend the public comment period beyond the July 23, 1986 dealine. EPA extended the comment period through October 31, 1986.

On November 13, 1986 EPA staff members met with local citizens and the Chamale Property Owners Association, to discuss the new Superfund Amendments and Reauthorization Act and also to discuss the concept of thermal destruction.

In February 1987 EPA issued a project update fact sheet describing the proposed alternative for overall cleanup of the Bayou Bonfouca Superfund site. A public meeting was held in Slidell on February 11, 1987 to discuss the cleanup plan with the public, some 250 of whom were in attendance. The orginally planned remedial action was changed from essentially a cap-in-place remedy to one that excavated an incinerated onsite all heavily contaminated sediment and the creosote waste piles.

Additionally, EPA staff members met with local officials including the Mayor, City Attorney and City Council representative.

II. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comments received during the January 30 to February 20, 1987 public comment period along with EPA responses include:

1) Why was the action level for polynuclear aromatic hydrocarbons (PAH's) changed from 1 ppm to 100 ppm?

The original number of 1 ppm was estimated value discussed in an early health assessment. The 1 ppm action level was based on a single hazardous compound common in creosote wastes. This was a worst case estimate.

In response to questions concerning the legitimacy of the 1 ppm figure the EPA requested and obtained an evaluation from the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR found the original risk assessment to be overly conservative and not indicative at the actual health threat. After careful study an action level of 100 ppm total PAH's was established. This level is considered safe for direct contact. This action level is consistent with Agency cleanup goals and with other Superfund cleanups. A copy of ATSDR's evaluation is part of the Administrative Record for the site (Appendix C).

2) Will the RCRA cap actually be five feet high?

There will be an approximate five feet rise over a 34 acre area. In order to maintain a positive offsite slope, it is possible that portion of the site may be 1 to 3 feet higher than this. The cap however, will likely appear as a very gentle rise although this aspect will be specifically addressed in the design phase.

3) Since there is very poor drainage in the area and the site lies within the 100 year flood plain of the Bayou, will the RCRA cap be designed with flood control in mind?

Yes. Conceptually, the drainage will be directed towards the bayou so as not to increase the flooding of neighboring properties. Flood control and the specific impact on drainage will be addressed in the design phase. All efforts will be made to minimize any adverse impacts of site drainage associated with the cap.

4) Will the land be useable after remediation?

Possibly. The EPA cannot consider future land use at a Superfund site. In remedial planning CERCLA/SARA's focus is on the protection of public health and environment as a basis for the selection of remediation. However, the land may be utilized as long as the integrity of the remedy is maintained.

5) Will incineration contribute to air or noise pollution?

No. To ensure proper operation of the incinerator, the design will specify parameters to be continously monitored. These will include: carbon monoxide, water feed rate, combustion temperature, and combustion gas velocity. The parameters are set during a pilot test and assure that any effluents present minimal impact on public health and the environment. If there is a malfunction, the incinerator will automatically stop operation.

Site noise will be minimized and will most likely be less than that of a typical construction site. Any dust, vapors, emission, noise, or any other factor affecting the community will be considered as part of the design considerations.

6) Will EPA guarantee that the proposed incinerator will be removed after cleanup?

Yes. The envisioned incinerator will be a mobile unit. Its only purpose is to thermally destroy the wastes associated with the Bayou Bonfouca site. Once this task is completed it will be removed.

7) What will be the hours of operation of the incinerator?

This has not yet been determined. This will be addressed during the Remedial Design. Before an operating time period is established citizen input will be solicited and reviewed.

8) Is the full extent of sediment and groundwater contamination defined?

The spatial extent of sediment and groundwater contamination was investigated during the Remedial Investigation. Although defined to the extent necessary to develop and propose a conceptual design, additional data will be collected for finalization of the detailed project design.

9) To what level will the groundwater be cleaned?

At this time it is not known what the lowest, technically feasible clean-up level is for the water. Groundwater treatment will essentially be a pilot study so the clean-up level will be defined once treatment begins and specific data are available. The engineers who developed the treatment technologies estimated that 90% of the wastes could be removed from the water. This will be further evaluated during pumping tests of the contaminated aquifers.

10) Why has E.P.A. changed the proposed remediation from the original alternative selected in 1986 for the Bayou Bonfouca site?

The original alternative proposed in June 1986 capped all the wastes in place, including all surface, drainage ditch, and bayou contamination. The alternative included bayou reclamation and a groundwater recovery treatment system. Subsequent to this meeting, area residents requested and received a 3-month extension to the public comment period, ending October 31, 1986. The new Superfund law was signed during this time (October 17, 1986) and had a significant impact on the what the Agency now considers to be acceptable remedial alternatives.

The new law sets stricter cleanup standards and strongly emphasizes permanent technologies that either treat or destroy wastes. Onsite incineration more closely meets these stricter standards, compared with earlier proposed cap-in-place alternative, in that it significantly reduces the toxicity, mobility, and volume of the

waste. Therefore, the EPA has changed the proposed remedial action to be more consistent with the provisions and preferences of the new Superfund law.

11) The Bayou Bonfouca site is within 1/2 mile of two shopping centers, two elementary schools, one middle school, one jr high school, and a hospital. Under the DOT Hazardous Incident Response Guidances, the area surrounding an incinerator should be isolated for 1/2 mile in all directions. Why is remediation being performed in the middle of a municipal area and are there contingency plans if the incinerator malfunctions?

The DOT regulations refers to hazardous incidents, remediation of the Bayou Bonfouca site through incineration is a controlled situation and not a hazardous incident. Therefore, gaseous and particulate emissions are stringently monitored and significant concentrations of volatiles are not being discharged into the atmosphere as they would be in an uncontrolled situation.

Any potential health hazards posed to the community will be considered throughout the design and implementation of the remedy. There will be a Site Safety Plan which deals specifically with questions of safety related to the site. A site Health and Safety Officer will be present for all site-related activities. In the unlikely event of a significant volatile release, appropriate steps would be taken. This is an important concern and specific precautionary measures will be addressed in the remedial design.

12) Is there any financial assistance available to help citizens participate in the selection of the remedial action?

Yes, SARA provides for a $50,000 grant to be made available to citizen groups in order to facilitate public participation in the selection of a remedial design. Not more than one grant may be made with respect to a single facility. Each grant recipient is required to contribute at least 20% of the total $50,000. The 20% contribution requirement may be waived if the recipient demonstrates financial need and the waiver is necessary to facilitate public participation in the selection of a remedial design. An 'in-kind' match may be allowable, and Federal Procurement Regulations will likely apply.

Currently, it is not known how a determination will be made between different groups requesting the funds or who will decide this issue.

13) To what depth will contaminated sediments be excavated?

Approximately 46,500 yds^3 of sediment will be excavated. The depth of excavation will be to about 5.0 feet although this will be specifically addressed in the design phase. The volume to be excavated will include the significantly contaminated sediment that acts as a source for continued groundwater contamination and inhibits biological growth.

14) Has dredging the contaminated sediment in the bayou rather than dewatering the bayou to excavate the sediment been reviewed as an alternative?

Yes. In dredging the bayou there is a strong possibility of re-suspending contamination in the water column. This is seen as potentially a significant environmental problem. Even with the newest technique, i.e., clam shell dredging, the contamination could be resuspended.

15) If there is a concern about resuspending contamination doesn't barge traffic disturb the sediment?

Yes, barge traffic does turbate the sediment but not to the degree that dredging would cause resuspension.

There is no information to date that shows that barge traffic presents an environmental concern.

16) If the bayou is to be dewatered one side at a time, how will commercial operations that use barges continue to function?

The EPA is aware that there are commercial properties on the bayou that depend on barge transportation. This will be considered and evaluated in the design phase.

17) Is there a potential threat to the food chain because of the contamination?

No. Aquatic organisms in the bayou have been locally affected, as a survey of benthic organisms revealed an absence of aquatic organisms in the site area. This however, does not present a threat to the food chain per se, it presents a threat to shellfish that may ingest the sediments. The site is posted to discourage fishing and swimming in the bayou. Once the site is cleaned up, no significant long-term effects are anticipated.

18) How will the increased flooding potential due to the bayou remediation plan be reduced?

Increased flooding potential will be a concern during dewatering operations. Steps will be taken to minimize any such risk. Specifics are not available at this time. The Remedial Design will address this in detail.

APPENDIX B

APPENDIX B
BAYOU BONFOUCA
SUMMARY OF REMEDIAL ALTERNATIVES

Eval. Criteria	Alt. No. 1 No Action	Alt. No. 2 Multilayer Cap Permanent Bayou Diversion	Alt. No. 3 Multilayer Cap Offsite Landfill of Sediments Only	Alt. No. 4 Onsite Landfill of Wastes	Alt. No. 5 Onsite Incineration of Wastes and Soils	Alt. No. 6 Onsite Incineration of Wastes, Soil Cap	Alt. No. 7 Onsite Landfarming of Wastes	Alt. No. 8 Offsite Landfarming of Wastes	Alt. No. 9 Multilayered Cap, Offsite Incineration of Sediments
Performance	*	-	-	-	++	++	o	o	++
Reliability	*	-	+	-	++	++	o	o	++
Implementability/ Constructability	*	++	++	++	+	+	-	o	++
Public Health	--	-	-	-	++	++	+	++	+
Environmental	--	-	-	-	++	++	+	++	+
Cost (Millions)									
Capitol Million $	0	20	25	20	80	60	20	29	110
O&M Cost (Annual) Thousand $	0	120	120	130	110	110	160	110	120
Time to Achieve (yrs)	-	1.5	1.5	2.5	1	1	3	2	0.5

-- Extremely negative impact
- Moderately negative impact
o No impact
+ Moderately positive impact
++ Very positive impact
* Not applicable to alternative

APPENDIX C

COST ESTIMATE SUMMARY
ALTERNATIVE 2: SLURRY WALL CAP AND TREATMENT SYSTEM FOR SOIL, SEDIMENT, AND GROUND WATER; WITH PERMANENT SURFACE WATER DIVERSION

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Permanent Surface Water Diversion	1,770,880		
2. Management of Contaminated Channels	2,807,944	11,800	
3. Installation of Soil and Ground Water Containment Systems	7,510,100	59,400	
4. Onsite Incineration of Waste Deposits			
5. Groundwater Treatment			
6. Site Monitoring	30,000	47,500	
7. Mobilization, Bonds, and Insurance (5%)	673,272	0	
8. Health and Safety (5%)	673,272	0	
CONSTRUCTION SUBTOTAL	13,465,438		
Bid Contingencies (15%)	2,019,816		
Scope Contingencies (20%)	2,693,088		
CONSTRUCTION TOTAL	18,178,342		
Permitting and Legal (5%)	908,917		
Services During Construction (8%)	1,454,267		
TOTAL IMPLEMENTATION COST	20,541,525		
Engineering Design Cost (8%)	1,643,322		
TOTAL CAPITAL COST	22,184,847		
PRESENT WORTH CAPITAL COST			22,184,847
TOTAL ANNUAL O&M COST		118,700	
PRESENT WORTH O&M COST			1,118,974
TOTAL PRESENT WORTH COST			23,303,822

COST ESTIMATE SUMMARY
ALTERNATIVE 3: SLURRY WALL CAP AND TREATMENT SYSTEM FOR SOIL, SEDIMENT, AND GROUND WATER; WITH WASTEPILE AND SEDIMENT REMOVAL AND DISPOSAL IN AN OFF-SITE LANDFILL

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Sediment Removal With Channel and Drainageway Restoration	2,778,504	11,928	
2. Wastepile and Sediment Disposal at Off-site Landfill	3,880,000	0	
3. Installation of Soil and Ground Water Containment Systems	6,710,100	59,400	
4. Groundwater Treatment			
5. Site Monitoring	30,000	47,500	
6. Mobilization, Bonds, and Insurance (5%)	744,367	0	
7. Health and Safety (5%)	744,367	0	
CONSTRUCTION SUBTOTAL	14,887,338		
Bid Contingencies (15%)	2,233,101		
Scope Contingencies (20%)	2,977,468		
CONSTRUCTION TOTAL	20,097,906		
Permitting and Legal (5%)	1,004,895		
Services During Construction (8%)	1,607,832		
TOTAL IMPLEMENTATION COST	22,710,634		
Engineering Design Cost (8%)	1,816,851		
TOTAL CAPITAL COST	24,527,484		
PRESENT WORTH CAPITAL COST			24,527,484
TOTAL ANNUAL O&M COST		118,828	
PRESENT WORTH O&M COST			1,120,181
TOTAL PRESENT WORTH COST			25,647,665

COST ESTIMATE SUMMARY
ALTERNATIVE 4: SOIL AND SEDIMENT REMOVAL AND DISPOSAL IN AN ON-SITE LANDFILL, WASTEPILE REMOVAL AND DISPOSAL IN AN OFF-SITE LANDFILL, WITH SLURRY WALL CAP, AND TREATMENT SYSTEM FOR GROUND WATER

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Soil Removal	252,000	0	
2. Sediment Removal With Channel and Drainageway Restoration	2,778,504	11,928	
3. Wastepile Removal and Disposal in Off-site Landfill			
4. On-site Landfill Construction and Implementation	638,460	15,000	
5. Installation of Ground Water Containment Systems	5,594,100	57,000	
6. Groundwater Treatment			
7. Site Monitoring	30,000	47,500	
8. Mobilization, Bonds, and Insurance (5%)	516,281	0	
9. Health and Safety (5%)	515,281	0	
CONSTRUCTION SUBTOTAL	10,325,627		
Bid Contingencies (15%)	1,548,844		
Scope Contingencies (20%)	2,065,125		
CONSTRUCTION TOTAL	13,939,596		
Permitting and Legal (5%)	696,980		
Services During Construction (8%)	1,115,168		
TOTAL IMPLEMENTATION COST	15,751,743		
Engineering Design Cost (8%)	1,260,139		
TOTAL CAPITAL COST	17,011,883		
PRESENT WORTH CAPITAL COST			17,011,883
TOTAL ANNUAL O&M COST		131,428	
PRESENT WORTH O&M COST			1,238,960
TOTAL PRESENT WORTH COST			18,250,843

COST ESTIMATE SUMMARY
ALTERNATIVE 5: WASTEPILE, SOIL AND SEDIMENT REMOVAL AND ON-SITE INCINERATION; WITH SLURRY WALL CAP, AND TREATMENT SYSTEM FOR GROUND WATER

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Soil and Wastepile Removal	252,000	0	
2. Sediment Removal With Channel and Drainageway Restoration	2,778,504	11,928	
3. On-site Incineration of Wastepiles, Containment Sediment	36,869,510	0	
4. Installation of Ground Water Containment Systems	4,335,100	54,900	
5. Groundwater Treatment			
6. Site Monitoring	30,000	47,500	
7. Mobilization, Bonds, and Insurance (5%)	2,460,284	0	
8. Health and Safety (5%)	2,460,284	0	
CONSTRUCTION SUBTOTAL	49,205,682		
Bid Contingencies (15%)	7,380,852		
Scope Contingencies (20%)	9,841,136		
CONSTRUCTION TOTAL	66,427,671		
Permitting and Legal (5%)	3,321,384		
Services During Construction (8%)	5,314,214		
TOTAL IMPLEMENTATION COST	75,063,268		
Engineering Design Cost (8%)	6,005,061		
TOTAL CAPITAL COST	81,068,330		
PRESENT WORTH CAPITAL COST			81,068,330
TOTAL ANNUAL O&M COST		114,348	
PRESENT WORTH O&M COST			1,077,948
TOTAL PRESENT WORTH COST			82,146,278

COST ESTIMATE SUMMARY
ALTERNATIVE 6: WASTEPILE, SOIL AND SEDIMENT REMOVAL AND ON-SITE INCINERATION WASTEPILES AND SEDIMENT WITH SLURRY WALL CAP, AND TREATMENT SYSTEM FOR GROUND WATER

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Onsite Pile Removal	252,000	0	
2. Sediment Removal With Channel and Drainageway Restoration	2,778,504	11,928	
3. On-site Incineration of Wastepiles, Sediment	19,529,066	0	
4. Installation of Slurry Wall and Soil Cap	5,960,100	59,400	
5. Installation of Ground Water Containment Systems	4,355,100	54,920	
6. Groundwater Treatment			
7. Site Monitoring	30,000	47,500	
8. Mobilization, Bonds, and Insurance (5%)	1,785,173	0	
9. Health and Safety (5%)	1,785,173	0	
CONSTRUCTION SUBTOTAL	35,703,460		
Bid Contingencies (15%)	5,355,519		
Scope Contingencies (20%)	7,140,692		
CONSTRUCTION TOTAL	48,199,671		
Permitting and Legal (5%)	2,409,984		
Services During Construction (8%)	3,855,628		
TOTAL IMPLEMENTATION COST	54,465,628		
Engineering Design Cost (8%)	4,357,250		
TOTAL CAPITAL COST	59,594,534		
PRESENT WORTH CAPITAL COST			58,822,878
TOTAL ANNUAL O&M COST		173,748	
PRESENT WORTH O&M COST			1,077,948
TOTAL PRESENT WORTH COST			59,900,827

COST ESTIMATE SUMMARY
ALTERNATIVE 7: WASTEPILE, SOIL AND SEDIMENT REMOVAL AND TREATMENT AT AN ON-SITE LANDFARM; WITH SLURRY WALL CAP, AND TREATMENT SYSTEM FOR GROUND WATER

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Wastepile Removal	252,000	0	
2. Sediment Removal With Channel and Drainageway Restoration	2,778,504	11,928	
3. On-site Landfarm Construction and Operation	5,094,481	768,000	
4. Installation of Ground Water Containment Systems	3,070,900	57,320	
5. Groundwater Treatment			
6. Site Monitoring	30,000	47,500	
7. Mobilization, Bonds, and Insurance (5%)	623,660	0	
8. Health and Safety (5%)	623,660	0	
CONSTRUCTION SUBTOTAL	12,473,206		
Bid Contingencies (15%)	1,870,981		
Scope Contingencies (20%)	2,494,641		
CONSTRUCTION TOTAL	16,838,828		
Permitting and Legal (5%)	841,941		
Services During Construction (8%)	1,347,106		
TOTAL IMPLEMENTATION COST	19,027,875		
Engineering Design Cost (8%)	1,522,230		
TOTAL CAPITAL COST	20,550,105		
PRESENT WORTH CAPITAL COST			20,550,105
TOTAL ANNUAL O&M COST		116,748	
PRESENT WORTH O&M COST			4,011,900
TOTAL PRESENT WORTH COST			24,562,005

COST ESTIMATE SUMMARY
ALTERNATIVE 8: WASTEPILE, SOIL AND SEDIMENT REMOVAL AND TREATMENT AT AN ON-SITE LANDFARM; WITH SLURRY WALL CAP, AND TREATMENT SYSTEM FOR GROUND WATER

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Wastepile Removal	252,000	0	
2. Sediment Removal With Channel and Drainageway Restoration	2,778,504	11,928	
3. On-site Landfarm Construction and Operation	17,989,300	0	
4. Installation of Ground Water Containment Systems	4,355,100	54,920	
5. Groundwater Treatment			
6. Site Monitoring	30,000	47,500	
7. Mobilization, Bonds, and Insurance (5%)	1,411,384	0	
8. Health and Safety (5%)	1,411,384	0	
CONSTRUCTION SUBTOTAL	28,227,671		
Bid Contingencies (15%)	4,234,151		
Scope Contingencies (20%)	5,645,534		
CONSTRUCTION TOTAL	38,107,356		
Permitting and Legal (5%)	1,905,368		
Services During Construction (8%)	3,048,588		
TOTAL IMPLEMENTATION COST	43,061,312		
Engineering Design Cost (8%)	3,444,905		
TOTAL CAPITAL COST	46,506,217		
PRESENT WORTH CAPITAL COST			46,506,217
TOTAL ANNUAL O&M COST		114,348	
PRESENT WORTH O&M COST			1,077,948
TOTAL PRESENT WORTH COST			47,584,166

COST ESTIMATE SUMMARY
ALTERNATIVE 9: SEDIMENT AND WASTEPILE REMOVAL AND OFF-SITE INCINERATION; WITH SLURRY WALL, CAP AND TREATMENT SYSTEM FOR GROUND WATER

COST COMPONENT	CONSTRUCTION COSTS $	ANNUAL O&M COSTS $	PRESENT WORTH COSTS $
1. Sediment Removal With Channel and Drainageway Restoration	2,778,504	11,928	
2. On-site Incineration of Sediment and Waste Piles	54,655,400	0	
3. Installation of Ground Water Containment Systems	6,260,100	59,400	
4. Groundwater Treatment			
5. Site Monitoring	30,000	47,500	
6. Mobilization, Bonds, and Insurance (5%)	3,540,222	0	
7. Health and Safety (5%)	3,540,222	0	
CONSTRUCTION SUBTOTAL	70,804,449		
Bid Contingencies (15%)	10,620,667		
Scope Contingencies (20%)	14,160,890		
CONSTRUCTION TOTAL	95,586,006		
Permitting and Legal (5%)	4,779,300		
Services During Construction (8%)	7,646,800		
TOTAL IMPLEMENTATION COST	108,012,187		
Engineering Design Cost (8%)	8,640,975		
TOTAL CAPITAL COST	116,653,162		
PRESENT WORTH CAPITAL COST			116,653,162
TOTAL ANNUAL O&M COST		118,828	
PRESENT WORTH O&M COST			1,120,181
TOTAL PRESENT WORTH COST			117,773,343

APPENDIX D

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date · SEP 1 1 1986

From Acting Director
Office of Health Assessment

Subject Bayou Bonfouca, SI-86-035B
Slidell, Louisiana

To Mr. Carl R. Hickam
Public Health Advisor
EPA Region VI

EXECUTIVE SUMMARY

The Remedial Investigation was evaluated for the potential public health threat to area residents from creosote contamination from the Bayou Bonfouca Site, Slidell, Louisiana. The possibility of an acute adverse health effect from sediment contamination to swimmers through dermal absorption exists. This statement is based on an incident where two Coast Guard divers received "second degree burns" while sampling the contaminated sediment in the Bayou. Since that time, other skin irritation incidents to area residents have been reported by the Public Health Advisor, EPA Region VI. Since we have no evidence to the contrary it would be prudent to minimize any unnecessary recreational activity in the vicinity of the bulkhead area until adequate sampling or remedial efforts of site contaminants are performed.

STATEMENT OF THE PROBLEM

The Agency for Toxic Subtances and Disease Reagistry (ATSDR) has been requested by the Environmental Protection Agency (EPA) to review and comment on the public health concerns provided in Chapter 4 of the Remedial Investigation (RI) Report.

BACKGROUND

The site is located in St. Tammany Parish, Slidell, Louisiana approximately 25 miles northeast of New Orleans. Bayou Bonfouca is the site where a creosote treating plant once operated along the edge of a Bayou. The plant burned down in 1970, and creosote was released from the

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storage tanks contaminating the surface soil, groundwater (surficial aquifer, shallow artesian aquifer), sediments of the Bayou, western creek, and drainage channel. The site covers 55 acres and is south of West Hall Avenue and north of and adjacent to Bayou Bonfouca. Bayou Bonfouca is a navigable waterway which flows into Lake Pontchartrain.

In April 1976, the U.S. Coast Guard collected samples from the Bayou. While collecting sediment samples, two Coast Guard divers suffered second-degree chemical burns. The investigation revealed that creosote was discharging into the Bayou via runoff. In 1982, the EPA placed the site on the National Priorities List. In 1983, a phased Remedial Investigation /Feasibility Study addressed on-site groundwater.

Additional data on soils to evaluate vertical and lateral migration of contaminants through the soils was also performed. The southern half of the property is heavily contaminated at the surface, and the surficial aquifer and the shallow artesian aquifer underlying the property are contamianted with creosote.

DOCUMENTS REVIEWED

1. Remedial Investigation Report, Bayou Bonfouca Site, CH2M Hill, Contract NO. 68-01-6692, April 25, 1986.

2. Phase II Feasibility Study, Bayou Bonfouca Site Draft, CH2M Hill, Contract No. 68-01-6692, May 8, 1986 revised June 2, 1986.

3. Memorandum, Charles H. Nauman, Environmental Toxicologist, Exposure Assessment Group (RD-689), Office of Research and Development, U.S. EPA, Washington, D.C., to Jim Peronto, Project Officer, ALONM Remedial Section (6H-SA), re: Review of the Bayou Bonfouca Public Health Evaluation Document, May 28, 1986.

PRINCIPAL CONTAMINANTS

Polynuclear aromatic hydrocarbons (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3,-cd)pyrene) are the major contaminants of concern. Other contaminants of concern (benzene, acetone, xylene, ethylbenzene, styrene) were detected at the site in both soil and groundwater. However, the RI states that "a review of the quality assurance information showed that benzene, acetone, and other volatile organics appeared in the analytical results because of laboratory contamination".

ENVIRONMENTAL PATHWAYS

Environmental pathways include surface and subsurface soil, on-site surficial groundwater, shallow artesian aquifer groundwater, and sediments from Bayou Bonfouca, the western creek, and drainage channel.

EXPOSURE PATHWAYS

Potential exposure pathways include ingestion of contaminated groundwater from the shallow artesian aquifer, ingestion of on-site soils, and ingestion of contaminated western creek or eastern channel sediments. Dermal contact may also be a exposure pathway.

POPULATION AT RISK

The potential population at risk includes 1) people that may use the bayou (bulkhead area) for recreational purposes, 2) people living or working down-gradient along the shallow artesian aquifer, 3) people living adjacent to the site especially the western edge, and 4) children using the western creek or the eastern drainage channel as play areas.

The U.S. Geologic Survey calculated 110 residences within 1 mile in the suspected direction of travel of the contaminated plume in the shallow artesian aquifer. Based on 1980 census data for this area this accounts for approximately 354 people.

DISCUSSION

Sediment

In 1976 two Coast Guard divers received "second degree burns" during sediment sampling. This incident has been corroborated by the Public Health Advisor, EPA Region VI. It was the conclusion of the installation medical authority that treated the Coast Guard divers that water and sediment contaminants, specifically, were responsible for this effect. A site visit by the Public Health Advisor to the area discovered other incidents whereby area residents reported skin irritation after swimming or wading in or around the bulkhead area of the Bayou. Power boats churning up the contaminated sediments when passing by this area may expose swimmers using this area for recreation to possible chemical burns. Since laboratory contamination of volatile organic compound (VOC's) samples was a possibility (doc. 3 pertaining to Page 4-8, Section 4.3.2 doc. 1), then resampling for VOC's at the Bayou Bonfouca Site (bulkhead area) should be repeated to rule out these compounds as site contaminants, and as a possible cause for the reported skin irritants in the Coast Guard divers and other area residents. Therefore, since we have no evidence to refute this information it may be prudent to refrain from any unnecessary recreational activities until resampling or remedial efforts have been satisfactorily completed on the Bayou Bonfouca bulkhead area.

Potable of Water

The RI states that primary drinking water standards for inorganics sampled from the surficial aquifer and the shallow artesian aquifer (arsenic, cadmium, barium, selenium, lead, chromium) were exceeded at Well West B. The RI further states that the significant and useable groundwater resources in the area do not include the surficial aquifer or the shallow artesian aquifer. Moreover, these water sources are limited in the ability to transport water and contaminants. There is no known consumption of water from either the surficial aquifer or the shallow artesian aquifer. Furthurmore, 11 known wells (including off-site wells)

within a one mile radius of the site have been drilled through the shallow artesian aquifer with no demonstrated creosote contamination.

Soil

The principal on-site PAH concentrations range from Not Detected (ND) to 13,450 ppm in sediment, ND to 13,680 ppm in soil and ND to 5 ppm in groundwater. The western creek and eastern channel areas are contaminated with the PAH's (ND- 840 ppm and ND - 496 ppm) respectively, and are unrestricted to children. In a published article[1], the Centers for Disease Control (CDC) derived an action level at which to limit human exposure for 2,3,7,8-tetrachloro- dibenzo-p-dioxin (2,3,7,8,-TCDD) contaminated residential soil. This derived value was based upon extrapolations from animal toxicity experiments (including carcinogenicity and reproductive effects) to possible human health effects in order to estimate a reasonable level of risk for 2,3,7,8-TCDD. A 10^{-6} excess lifetime risk was used in the development of this TCDD soil level.

The Environmental Protection Agency's Carcinogen Assessment Group has derived a relative potency index for more than 50 chemicals[2]. The order of magnitude potency index for 2,3,7,8-TCDD is eight, while that for benzo(a)pyrene is only three. Thus, 2,3,7,8-TCDD is considered to be five orders of magnitude more potent as a carcinogen than benzo(a)pyrene. Using this order of magnitude difference in potency between the two chemicals and the CDC-derived residential soil action level, gives 100 ppm of benzo(a)pyrene equivalent to 1 ppb of 2,3,7,8-TCDD in soil.

In the model used to derive the 2,3,7,8-TCDD soil value, the assumption concerning the amount of soil ingested has been shown to be high. A recent unpublished study by CDC has shown the amount of soil ingested by children of the soil-eating age ranges from 0.1 to 1 gram per day (S. Binder personal communication). Thus, the model estimate for soil ingestion during the period of minimum hygiene is excessive by at least an order of magnitude. Since the other soil ingestion rates in the model are

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also estimates, there is a good likelihood that they are also in error, possibly by more than an order of magnitude. Thus, the model very likely overestimates the total lifetime soil ingestion exposure by at least one order of magnitude.

In addition, the model contains a factor to account for the environmental degradation of the specific chemical. The factor for 2,3,7,8-TCDD assumed a 12-year half-life in soil. While the numerous PAH's have a range of half-life values in surface soil, which will be dependent upon the specific soil and climatological conditions encountered, even the maximum half-life for the most degradation-resistant compound is less than the value assigned for 2,3,7,8-TCDD in the model. Even with a six year half-life, a person's lifetime exposure would be substantially reduced when compared to that estimated with the longer half-life used in the TCDD risk assessment.

In addition, when considering the significance of contamination at the site, the facts that all PAH's are neither carcinogenic nor (for those suspected carcinogens) as potent as benzo(a)pyrene must be a part of the evaluation. As a first approximation of a site, it may be valid to use the total PAH concentration to determine an estimate of the significance of the contamination. However, when determining cleanup action, the use of isomers and compounds, which are truly hazardous, would be most appropriate when that information is available.

The application of the model assumes that all PAH's are as potent as benzo(a)pyrene, generally considered to be the most potent carcinogen of the PAH's. This is not valid, as those PAH compounds which are considered to be suspected or probable carcinogens, comprise less than half of the total PAH concentration at any site. In addition, many of these compounds designated as suspected or probable carcinogens, are much less potent than benzo(a)pyrene[3].

Thus, considering only these two areas for modifications to the soil exposure model used to develop the 2,3,7,8,-TCDD risk assessment, a residue less than 100 ppm of PAH's in residential soil does not present a human health hazard. Since the western creek and eastern channal are contaminated with PAH's higher than 100 ppm it would be advisable to restrict access to children who may play in or around these areas until remediation efforts are performed.

CONCLUSION

The Bayou Bonfouca bulkhead area is contaminated and may pose an acute potential public health threat to persons using this section of the Bayou for recreational activities. The residences to the south and southwest of the site are potentially affected by contaminant migration off-site. PAH's concentrations in residential soil more than 100 ppm presents an unacceptable public health risk through any normal route of exposure.

RECOMMENDATIONS

1. Resample Bayou sediment for volatile organic compounds.

2. Restrict access to the bulkhead area from recreational activities until resampling for VOC's demonstrates that an acute adverse health effect from dermal exposure does not exist.

3. Restrict access to the western creek and eastern channal area.

4. Continue monitoring groundwater, soil and sediment plumes that for possible off-site migration

Edwin Kato for
Jeffrey A. Lybarger, M.D.

REFERENCES

1. Kimbrough, R.D., Falk, H., Stehr, P., and Fries, G., "Health Implications of 2,3,7,8-tetrachlorodibenzodioxin (TCDD) Contamination of Residential Soil," J. Tox. & Envir. Health, 14 47-93, 1984.

2. EPA, "Health Assessment Document for Epichlorohydrin, Final Report," EPA-600/8-83-032F, pp. 7-62, 1984.

3. "Evaluation of the Carcinogenic Risk of Chemicals to Humans, Polynuclear Aromatic Compounds, Part 1, Chemical, Environmental and Experimental Data," IRAC Monographs, Volume 32, International Agency for Research on Cancer, IRAC, Lyon, France, 1983.

4. EPA, Office of Drinking Water, Criteria and Standards Division, Draft Health Advisory, September 1985.

APPENDIX E

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

March 27, 1987

MEMORANDUM

SUBJECT: Bayou Bonfouca Remedial Evaluation from the Agency for Toxic Substances and Disease Registry

FROM: Carl Hickam, Senior Public Health Advisor
Agency for Toxic Substances and Disease Registry

TO Kathleen O'Reilly, Geologist
ALONM Remedial Section (6H-SA)

The Region VI office of the U.S. Environmental Protection Agency has requested the Agency for Toxic Substances and Disease Registry (ATSDR) to review and comment on the proposed alternative to be implemented in Slidell, Louisiana. After careful review of the data from this site the following comments regarding this proposed cleanup alternative are provided by the scientific staff of the Agency for Toxic Substances and Disease Registry.

Onsite incineration of the wastes at this site, using current technology, would protect public health by destroying the material. It would also eliminate the requirements for either onsite containment and monitoring, or offsite transportation and either containment and monitoring or destruction. ATSDR agrees with Region VI's plan for onsite destruction of the creosote contaminated waste piles, soil, and sediment.

The Agency for Toxic Substances and Disease Registry if requested, will review any data that might be generated from the implementation of the proposed remedy.

The Agency does appreciate the opportunity to comment on the proposed remediation alternative for the Bayou Bonfouca.

APPENDIX F

RECEIVED
EPA-REGION VI
MAR 23 1987
Hazardous Waste
Management Div.

Martha A. Madden
SECRETARY

OFFICE OF SOLID AND HAZARDOUS WASTE

JOHN KOURY
ASSISTANT SECRETARY

March 11, 1987

Mr. Allyn M. Davis
Director
Hazardous Waste Management Division
US EPA Region VI
1201 Elm Street
Dallas, Texas 75270

Dear Mr. Davis:

Based upon a review of the Draft Feasibility Study, the Department of Environmental Quality concurs with the proposed remedy for the Bayou Bonfouca Site with the following comments:

1) It is understood that concerns of local residents as to possible adverse impacts of the project on local drainage will be fully considered during the engineering design phase.

2) The Department of Environmental Quality will likewise be interested in any technical issues related to alteration of stream flow and/or disturbance of sediments to be considered during the engineering design phase.

If this office can be of further assistance, please feel free to contact us.

Sincerely,

Martha A. Madden
Secretary

MAM/WBD/de